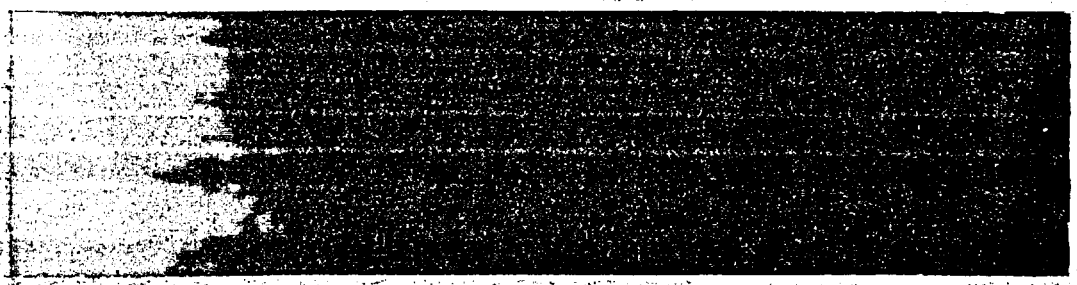
6 pg.

132159

NUS CORPORATION
A Halliburton Company



PROJECT FOR PERFORMANCE OF REMEDIAL RESPONSE ACTIVITIES AT UNCONTROLLED HAZARDOUS SUBSTANCE FACILITIES—ZONE 1

NUS CORPORATION
SUPERFUND DIVISION

R-585-2-6-40

A FIELD TRIP REPORT FOR OSBORNE DISPOSAL PREPARED UNDER

TDD NO. F3-8508-37
EPA NO. PA-681
CONTRACT NO. 68-01-6699

FOR THE

HAZARDOUS SITE CONTROL DIVISION
U.S. ENVIRONMENTAL PROTECTION AGENCY

SEPTEMBER 11, 1986

NUS CORPORATION
SUPERFUND DIVISION

SUBMITTED BY

Thomas W Fromm
THOMAS FROMM
ASSISTANT MANAGER

REVIEWED AND APPROVED BY

GARTH GLENN
MANAGER, FIT III

SECTION 1

TABLE OF CONTENTS

APPENDICES

1.0 INTRODUCTION

1.1 Authorization

NUS Corporation performed this work under Environmental Protection Agency Contract No. 68-01-6699. This specific report was prepared in accordance with Technical Directive Document No. F3-8508-37 for the site entitled Osborne Disposal located in Grove City, Pennsylvania.

1.2 Scope Of Work

NUS FIT III was tasked to excavate and sample test pits, collect drum samples if drums were found, and complete an environmental sampling program at the subject site. This project was completed in support of the CERCLA Enforcement Program.

1.3 Summary

The Osborne Disposal site consists of an approximately 15-acre, abandoned strip mine located in Grove City, Pennsylvania. The site allegedly received hazardous waste during the 1960s and 1970s. A remedial investigation study has been completed by Fred C. Hart Associates, acting as the responsible party's consultant. A copy of this report has been included as appendix C; please refer to it for background information. At the request of EPA and the Pennsylvania Department of Environmental Resources (PA DER), NUS FIT III performed this additional work at the subject site. The excavation and sampling program (see appendix D) was developed by PA DER and completed as a joint venture by PA DER, EPA, and NUS.

SECTION 2

2.0 FIELD TRIP REPORT

2.1 Summary

NUS FIT III members Andrew Frebowitz, Charles Meyer, James Strickland, Michael McCarthy, Brian FitzPatrick, and Thomas Fromm completed the project as tasked during a 5-day period, from September 23 through September 27, 1985. The team was accompanied on site by representatives of EPA, PA DER, Cooper Industries, Fred C. Hart Associates, and the excavation subcontractor, B.E.S. Environmental Specialists.

2.2 Persons Contacted

2.2.1 Prior to Field Trip

Hector Abreu Cintron
EPA CERCLA Enforcement Section
841 Chestnut Building
Ninth and Chestnut Streets
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Randall Roush
Chemist
Bureau of Solid Waste Management
PA DER
P.O. Box 2063
Harrisburg, PA 17120
(717) 783-7816

2.2.2 At the Site

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Senior Facilities Engineer
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Boyd Dunn
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2.2.2 At the Site (continued)

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Scott Blauvelt
Kenneth Interval
Fred C. Hart Associates
Penn Center West
Building 3
Suite 106
Pittsburgh, PA 15276
(412) 787-7144

DI[illegible]ber [illegible]85 -3 [illegible] SA[illegible]LE [illegible]te N[illegible] Os[illegible]ne [illegible]

P[illegible] number [illegible] EM-lexi

TRAFFIC REPORTS			SAMPLING LOCATION	PHASE	SAMPLE DESCRIPTION	DATE	TIME	pH	COMMENTS/OBSERVATIONS	LABORATORY
Organic	Inorganic	High Hazard								
X		C5758	DRUM # 1	Solid	Sludge like material	9-25-85	1132	—	up to 750 PPM (HNu)	GSRI
	X	C5759	DRUM # 1	Solid	sludge like material	9-25-85	1132	-	up to 750 PPM (HNu)	GSRI
X		C5756	DRUM # 2	Liquid	Drummed Liquid	9-25-85	1240	-	up to 400 ppm (HNu)	GSRI
	X	C5757	DRUM # 2	Liquid	Drummed Liquid	9-25-85	1240	-	up to 400 ppm (HNu)	GSRI
373	MCD 132	—	P-3	Solid	Low conc. soil	9-24-85	1335	-		CHEMTECH S Cubed
374	MCD 133	—	TP-10	Solid	Low conc. soil	9-24-85	1433	-		"
375	MCD 134	—	TP-7	Solid	Low conc. soil	9-24-85	1452	—		"
c 376	MCD 135	—	TP-5	Solid	Low conc. soil	9-24-85	1537	-		"
c 377	MCD 136	—	TP-4A	Solid	Low conc. soil	9-24-85	1555	—		"
c 378	MCD 137	—	TP-4B	Solid	Low conc. Soil	9-24-85	1612	—		"
c 379	MCD 138	—	L-1	Solid	Low conc. Soil	9-24-85	1652	—		"
380	MCD 139	—	L-3	Solid	Low conc. Soil	9-24-85	1700	—		"
c 381	MCD 140	—	TP-3	Solid	Low conc. soil	9-24-85	1717	—		"
c 382	MCD 141	—	TP-12	Solid	Low conc. soil	9-25-85	0915	—		"
c 383	MCD 142	—	P-1	Solid	Low conc. Soil	9-25-85	1002	—		"
c 384	MCD 143	—	TP-13	Solid	Low conc. Soil	9-25-85	1132	—		"
385	MCD 144	—	TP-14	Solid	Low conc. Soil	9-25-85	1624	-		"
c 386	MCD 145	-	TP-4BD	Solid	Low conc. Soil	9-24-85	1612	—		CHEMTECH NUS
387	MCD 146	-	S-3 (1"-6")	Solid	Low conc. Soil	9-26-85	0909	-		"
388	MCD 147	-	S-3 (6"-12")	Solid	Low conc. Soil	9-26-85	0928	-		"

300312

DD ber 350 7 2.3 SA E Ne Ohi Di

IPA number (A-611 (

TRAFFIC REPORTS			SAMPLING LOCATION	PHASE	SAMPLE DESCRIPTION	DATE	TIME	pH	COMMENTS/OBSERVATIONS	LABORATORY
Organic	Inorganic	High Hazard								
356	MCD 088	-	S-4A	Solid	Low conc. soil	9-25-85	1026			CHEMTECH S-CUBED
357	MCD 089	-	S-4	Solid	Low conc. soil	9-25-85	1021			"
358	MCD 090	-	S-2	Solid	Low conc. soil	9-25-85	1341			"
360	MCD 092	-	S-8 (1"-6")	Solid	Low conc. soil	9-25-85	1234			"
361	MCD 093	-	S-8 (6"-12")	Solid	Low conc. soil	9-25-85	1240			"
362	MCD 094	-	S-8A (1"-6")	Solid	Low conc. soil	9-25-85	1205			"
363	MCD 095	-	S-8A (6"-12")	Solid	Low conc. soil	9-25-85	1216			"
371	MCD 131	-	Blank	Solid	Low conc. soil	9-25-85	-			"

300313

DD number [illegible]-37 SAMPLE [illegible] Name [illegible] Osborne Division

P.O. number ( ) Actual

TRAFFIC REPORTS Organic	Inorganic	High Hazard	SAMPLING LOCATION	PHASE	SAMPLE DESCRIPTION	DATE	TIME	pH	COMMENTS/OBSERVATIONS	LABORATORY
389	MCD 148	-	Blank	Solid	Low conc. soil	9-25-85	1430			CHEMTECH S-cubed
390	MCD 149	-	TP-15	Solid	Low conc. soil	9-26-85	0915			CHEMTECH NUS
391	MCD 151	-	TP-17	Solid	Low conc. soil	9-26-85	1115			"
392	MCD 152	-	TP-18	Solid	Low conc. soil	9-26-85	1157			"
393	MCD 153	-	TP-19	Solid	Low conc soil	9-26-85	1226			"
372	MCD 096	-	LW-1	AQ	Low conc. AQ	9-24-85	1504	6.0		CHEMTECH SRI
365	MCD 097	-	LW-2	AQ	Low conc. AQ	9-24-85	1343	6.0		"
366	N/A	-	LW-3	AQ	Low conc. AQ	9-24-85	1505		Due to insufficient volume VOA only	"
367	MCD 098	-	LW-4	AQ	Low conc. AQ	9-24-85	1455	5.5		"
368	MCD 099	-	LW-2A	AQ	Low conc. AQ	9-24-85	1343	6.0		"
369	MCD 100	-	Blank	AQ	Low conc. AQ	9-24-85	1630			"
370	MCD 130	-	Bailer Blank	AQ	Low conc. AQ	9-24-85	1645			"
348	MCD 080	-	S-1	Solid	Low conc. soil	9-25-85	0901			CHEMTECH S-cubed
349	MCD 081	-	S-9A	Solid	Low conc. soil	9-25-85	0925			"
350	MCD 082	-	S-9	Solid	Low conc. soil	9-25-85	0945			"
351	MCD 083	-	S-9B	Solid	Low conc. soil	9-25-85	1003			"
362	MCD 084	-	S-6	Solid	Low conc. soil	9-25-85	0853			"
353	MCD 085	-	S-5	Solid	Low conc. soil	9-25-85	0918			"
c 354	MCD 086	-	S-7A	Solid	Low conc. soil	9-25-85	0935			"
c 355	MCD 087	-	S-7	Solid	Low conc. soil	9-25-85	1045			"

300314

2.4 Site Observations

2.4.1 General

- Weather conditions during the 5-day period were consistently mild and clear.
- No HNU or mini-alert readings above background levels were recorded in the breathing zone throughout the site.
- A 6-foot chain-link fence encircled the entire site and a gate at the entrance remained locked at all times.

2.4.2 Environmental Sampling Program: James Strickland, Team Leader

- Split samples were provided to Fred C. Hart Associates at all sample locations.
- An attempt was made to purge at least 3 volumes from each of the 4 leachate wells on site, and each was allowed to recharge a full 24 hours prior to sampling.
- The following is a summary of pertinent data on wells:

	L.W. no. 1	L.W. no. 2	L.W. no. 3	L.W. no. 4
Depth to water	13 feet	16.6 feet	17.3 feet	9.2 feet
Total depth	34.1 feet	27.6 feet	17.6 feet	21.4 feet
Stick-up	2.5 feet	2.5 feet	2.6 feet	2.5 feet
HNU reading	background	35 ppm above bkgd.	40 ppm above bkgd.	1 ppm above bkgd.
Depth to water after purging	14 feet	17 feet	not purged	21.3 feet

- o L.W. No. 2 was sampled in level B protective garb.
- o A VOA sample only was collected from L.W. No. 3 due to insufficient volume.
- o An attempt was made to collect soil samples as close as possible to locations designated on the PA DER sampling plan (see appendix D).

2.4.3 Excavation/Sampling of Test Pits Observations: Andrew Frebowitz, Team Leader

Sample Location S2

- o A sediment sample from pond no. 3 was obtained by the excavator.
- o Sample material was a dark brown to black sludge-like sediment.
- o The HNU reading was 0 ppm.

Lime Pit No. 1 (L1)

- o The pit had a 1-foot cover of lime.
- o Native soil was a dark brown sandy clay.
- o The pit was excavated to 6 feet in total depth where a sample was obtained.
- o The HNU reading was 0 ppm.

Lime Pit No. 2 (L2)

- o The top 1.5 feet consisted of a lime and ash mixture.
- o An additional 3 feet of dark brown sandy clay were removed.

- The HNU reading was 1 ppm.
- EPA, PA DER, and NUS personnel decided not to sample at this location.

Lime Pit No. 3 (L3)

- The pit had 2 feet of lime cover.
- Soils at depths of 2 to 4 feet were a light brown sandy loam.
- The soil at a depth of 7 feet was a dark brown sandy loam.
- Groundwater infiltrated the pit at a depth of 7 feet; a sample was obtained at this point.
- The HNU reading was 1 ppm.

Pond No. 1 (P1)

- The pond had no standing water.
- The sample was obtained at a depth of 4 feet.
- An HNU reading of 5 ppm was recorded.

Pond No. 2 (P2)

- The excavation was on the side of pond no. 2.
- The native soil was a light brown sandy loam; no stains were observed.
- The HNU reading was 0 ppm.
- A sample was not obtained at this location.

Pond No. 2 Test Pits

- Three test pits were excavated in pond no. 2 to identify the presence of buried drums.
- These pits were each 6 feet in depth; groundwater was encountered at this point.
- Sediments in the pits were black fill material.
- No drums were encountered in the pits.
- HNU readings reached 5 ppm in the pits.

Pond No. 3 (P3)

- A pit, 4 to 5 feet in depth, was excavated approximately 10 feet from the edge of pond no. 3.
- Soil that was sampled was a light brown sandy loam.
- The HNU reading was 0 ppm.

Test Pit No. 1 (TP1)

- The pit was 15 feet long by 5 feet wide by 15 feet deep. Groundwater was encountered at 15 feet.
- No stained soils were observed.
- The HNU reading was 0 ppm.
- A sample was not obtained from TP1.

Test Pit No. 2 (TP2)

- The pit was 10 by 6 by 18 feet.
- No stained soil was observed.
- The HNU reading was 0 ppm.
- A sample was not obtained.

Test Pit No. 3 (TP3)

- The pit was 8 by 5 by 10 feet. Groundwater was encountered at 10 feet.
- No stains were observed in the dark brown sandy loam.
- The HNU reading was 0 ppm.
- A sample was collected from a depth of 10 feet.

Test Pit No. 4 (TP4)

- Sample TP4A was obtained at a depth of 8 feet.
- An HNU reading of 100 ppm was recorded for TP4A.
- Sample TP4B and a duplicate were obtained from a depth of 15 feet.
- The HNU reading was 10 ppm for TP4B.
- No stained soils were observed.

Test Pit No. 5 (TP5)

- The top 6 feet were a sandy loam with black stains.
- A solvent odor was noticeable.
- A sample was taken at a depth of 16 feet.
- The HNU reading was 5 ppm.

Test Pit No. 6 (TP6)

- The pit area was fill material consisting of rocks and metal debris mixed with a dark brown sandy loam.
- The pit was excavated to a depth of 14 feet.
- The HNU reading was 0 ppm.
- No samples were collected from TP6.

Test Pit No. 7 (TP7)

- The pit was 15 by 8 by 15 feet. A sample was obtained at a depth of 15 feet.
- The HNU reading was 10 ppm.
- Solvent odors were noticeable.
- Excavated materials were fill containing foundry waste, blasting fines, paint cans and lids, wood, and concrete.

Test Pit No. 8 (TP8)

- The pit was 15 by 6 by 15 feet.
- The HNU reading was 0 ppm.
- A black fill material containing foundry wastes was excavated.
- No samples were obtained from this test pit.

Test Pit No. 9 (TP9)

- The pit was 8 by 5 by 15 feet.
- Six inches of foundry waste covered the native soil, a light brown sandy loam.
- The HNU reading was 0 ppm.
- No samples were obtained from this location.

Test Pit No. 10 (TP10)

- The pit was 8 by 4 by 15 feet. A sample was collected at 15 feet.
- Foundry waste, wood, and scrap metal covered a light brown sandy loam.
- Solvent odors were noticed.
- The HNU reading was 500 ppm.

Test Pit No. 11 (TP11)

- The pit was 10 by 4 by 20 feet.
- Demolition debris covered the pit location.
- Excavated material was foundry waste mixed with sandy loam.
- The HNU reading was 0 ppm.
- No samples were obtained from this location.

Test Pit No. 12 (TP12)

- The pit was located on top of the high wall above pond no. 1.
- The HNU reading was 0 ppm.
- Foundry wastes and demolition debris were removed from the 12 feet deep pit.
- A sample was taken from a depth of 12 feet.

Test Pit No. 13 (TP13)

- TP13 was located on the edge of pond no. 2.
- Foundry wastes were found at depths to 8 feet.
- A drum was encountered at 8 feet in depth.
- HNU readings in the pit were 1,000 ppm.
- A thick, dark liquid flowed from an opening in the drum. The HNU reading was 750 ppm.

- Samples were taken from the pit soil as well as from the drum.
- A second drum was encountered at a depth of 5 feet after the test pit width was increased.
- The drum was intact except for a 1/2 inch wide hole in the side and a 1/8 inch diameter hole on the bottom.
- A clear liquid with an HNU reading of 400 ppm was sampled from the drum. A soil sample was also collected.
- The excavated drums were placed in overpacks by B.E.S. personnel.
- The drums had no markings.
- The overpacks were placed in an abandoned concrete bunker on the site.

Test Pit No. 14 (TP14)

- A sample was obtained at a depth of 6 feet.
- Soil that was sampled was a dark brown sandy loam with black and yellow stains. The HNU readings at this point were 200 ppm.
- The excavation was continued to a depth of 12 feet. The HNU readings were 3 to 5 ppm.
- No additional samples were taken.

Test Pit No. 15 (TP15)

- An empty, unmarked drum and foundry wastes were on the surface of the area to be excavated.
- Remnants of a drum were uncovered at 10 feet in depth. HNU readings at this point were 100 ppm. A soil sample was obtained.

- The test pit was widened and lengthened in an attempt to locate other drums.

- A second drum fragment was found at 12 feet in depth and a third was uncovered at 14 feet. The HNU readings were 0 ppm.

- A fourth drum fragment was uncovered at 15 feet in depth; the HNU reading was 20 ppm.

- All drums were badly decomposed and had no markings.

- The final pit dimensions were 12 by 8 by 15 feet.

Test Pit No. 16 (TP16)

- The pit was 10 by 6 by 15 feet.

- The HNU reading was 5 to 7 ppm.

- Fill material that was excavated consisted of foundry wastes and demolition debris.

- No samples were obtained.

Test Pit No. 17 (TP17)

- The pit was excavated to a depth of 12 feet, the point at which groundwater was encountered.

- Excavated material consisted of foundry wastes which had HNU readings of 10 to 15 ppm. A sample of this material was taken.

Test Pit No. 18 (TP18)

- The pit was 10 by 5 by 15 feet in depth.
- At 10 feet in depth, a solvent odor was noticed. The HNU reading was 15 to 20 ppm. A sample of the dark brown sandy loam was obtained.
- At 15 feet in depth, the HNU readings decreased. Soil was a brown sandy clay mixed with gray silty loam. No sample was taken.

Test Pit No. 19 (TP19)

- The pit was 8 by 4 by 10 feet.
- The HNU reading was 20 ppm.
- A sample of light brown sandy loam was obtained.

General Observations

- All samples obtained during the excavations were collected from the central portion of the bucket.

2.5 PHOTOGRAPH LOG

Photo 1-
Lime Area No. 1 (L1)

Photo 2-
Lime Area No. 2 (L2)

300326

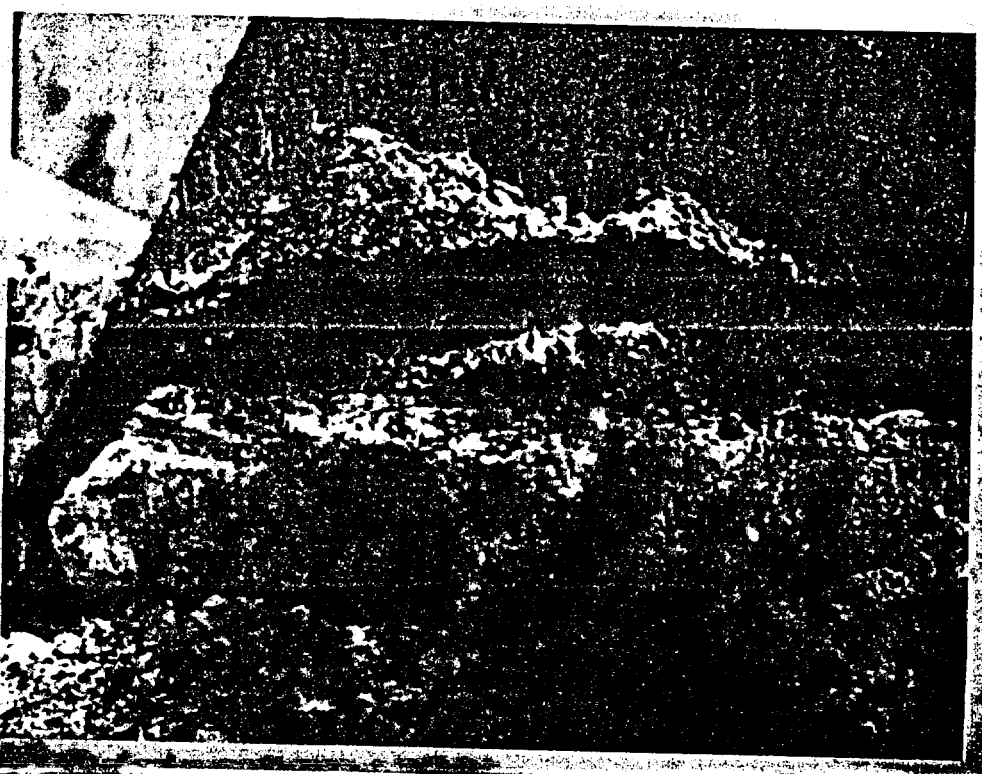

Photo 3-
Lime Area No. 3 (L3)

Photo 4-
Test Pit No. 1 (TP1)

300327

Photo 5-
Test Pit No. 2 (TP2)

Photo 6-
Test Pit No. 3 (TP3)

300328

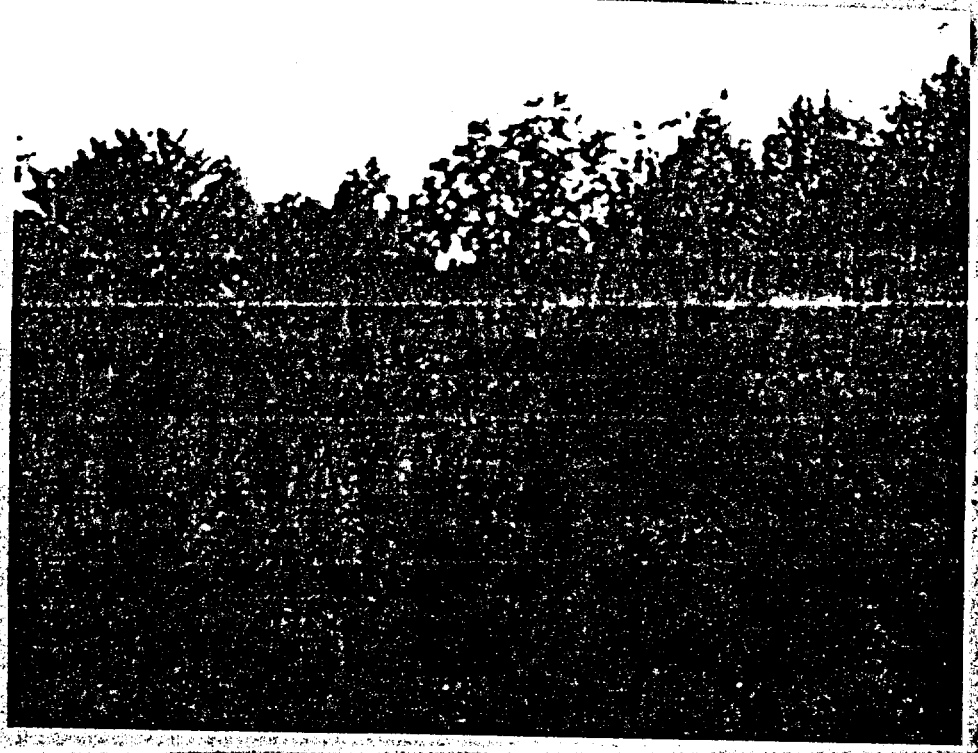

Photo 7-
Test Pit No. 4 (TP4)

Photo 8-
Test Pit No. 5 (TP5)

300329

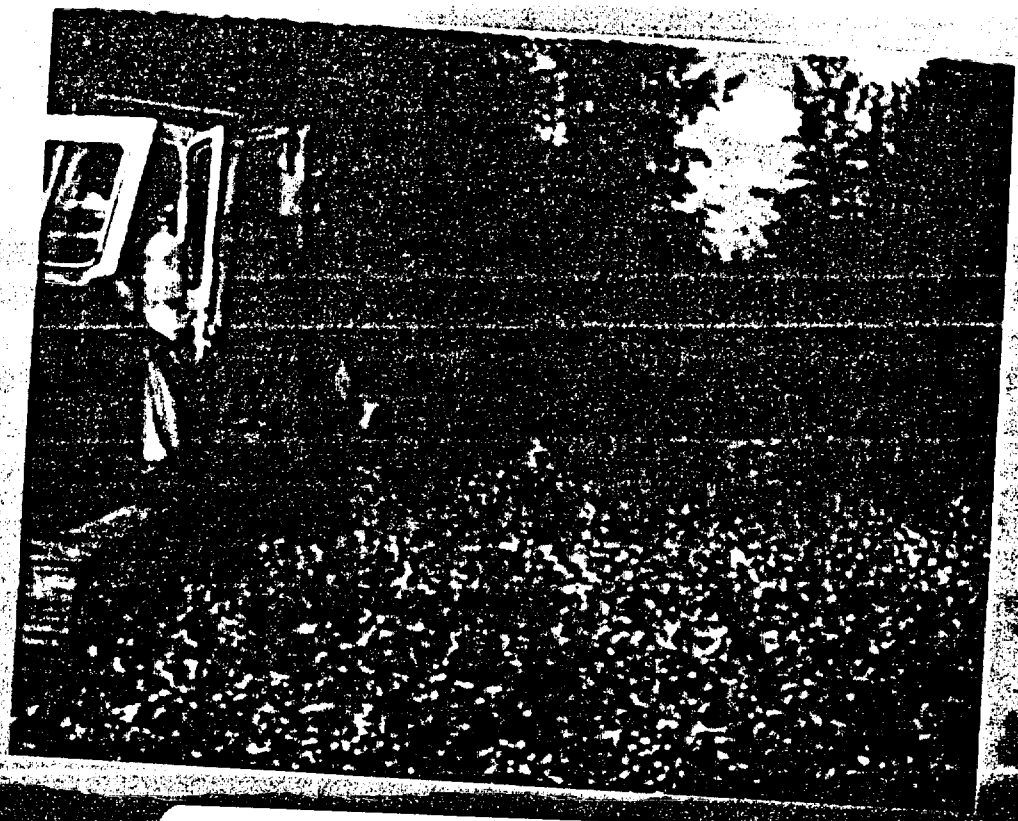

Photo 9-
Test Pit No. 6 (TP6)

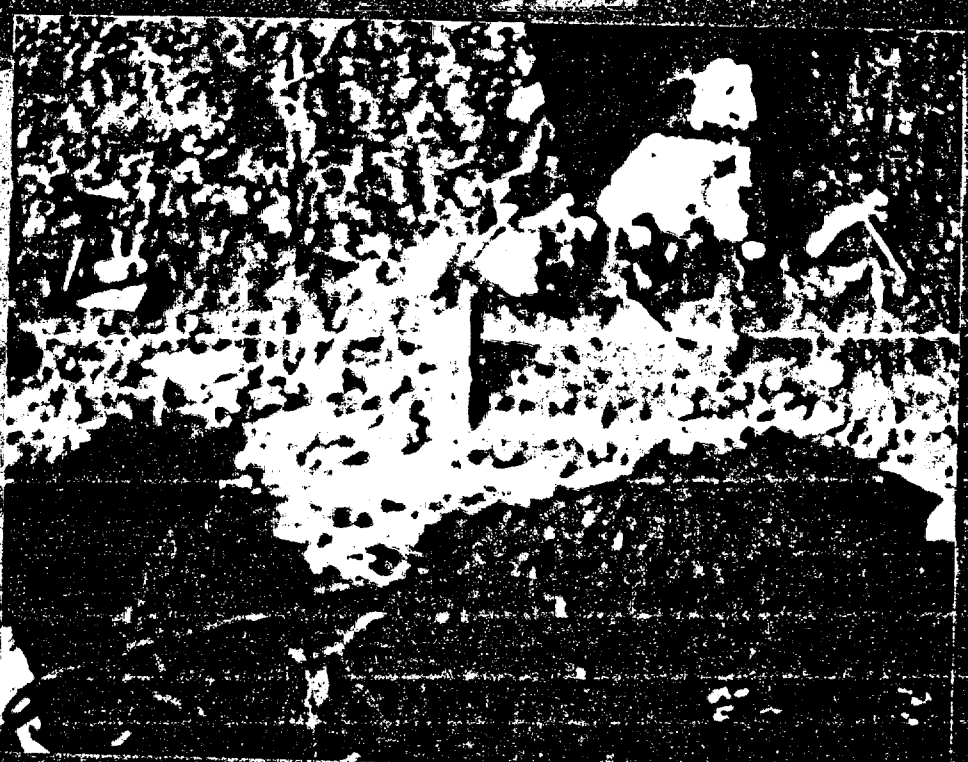

Photo 10-
Pond No. 1 (P1)

300330

Photo 11-
Test Pit No. 8 (T.P.8)

Photo 12-
Test Pit No. 9 (T.P.9)

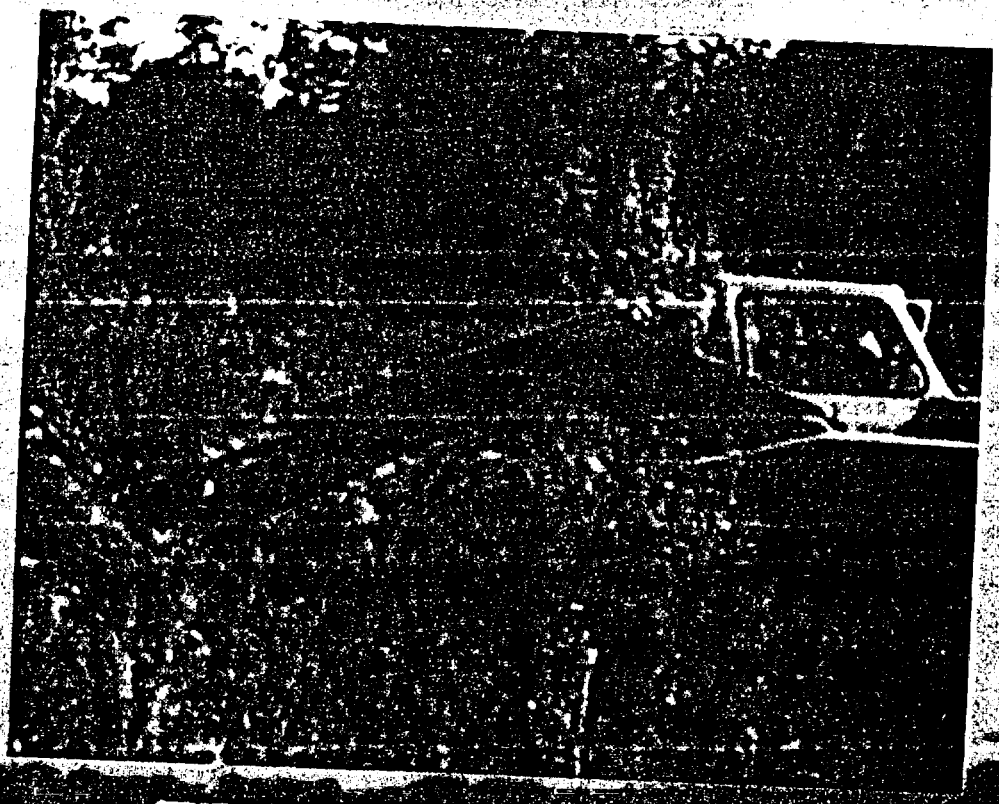

Photo 13-
Test Pit No. 10 (TP10)

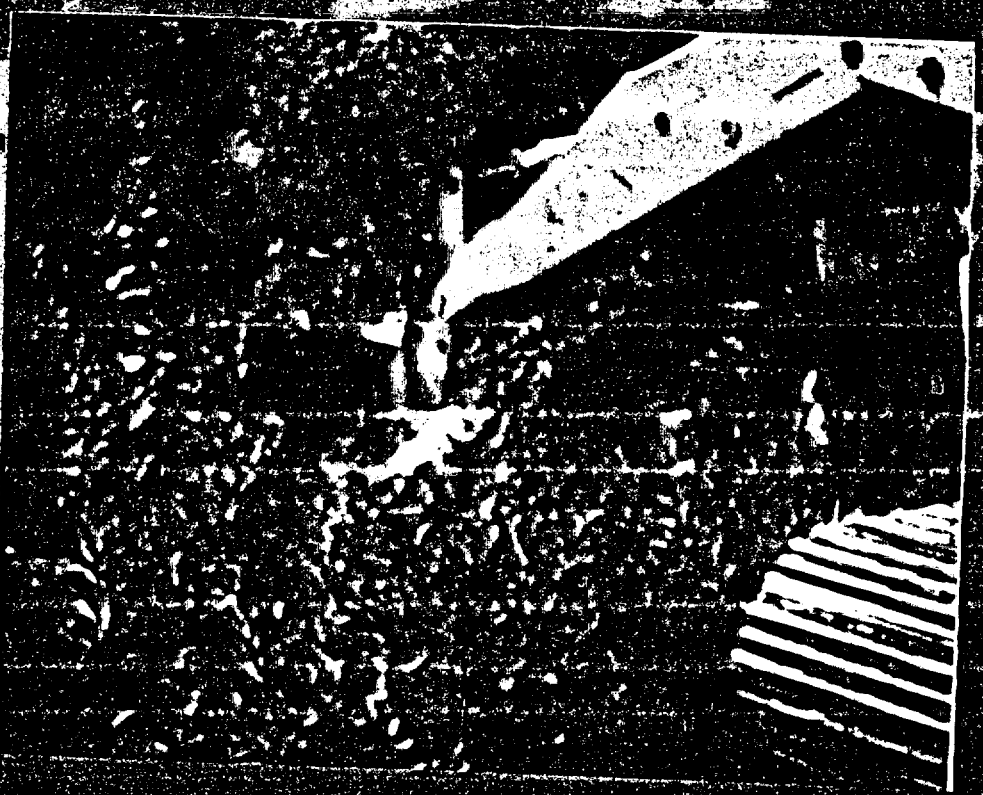

Photo 14-
Test Pit No. 11 (TP11)

Photo 15-
Pond No. 3 (P3)

Photo 16-
Sample Location: S2

300333

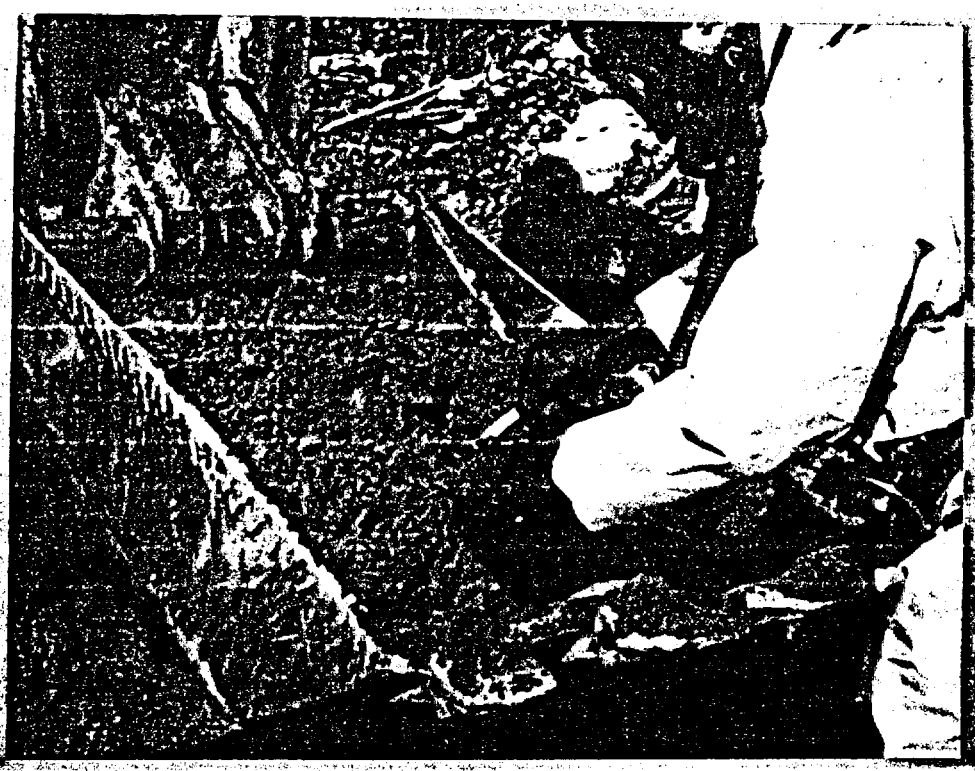

Photo 17-
Test Pit No. 10 (TP10) Sample

Photo 18-
Test Pit 4 (TP4): TP4A Sample

Photo 19-
TP4B Samle Socation

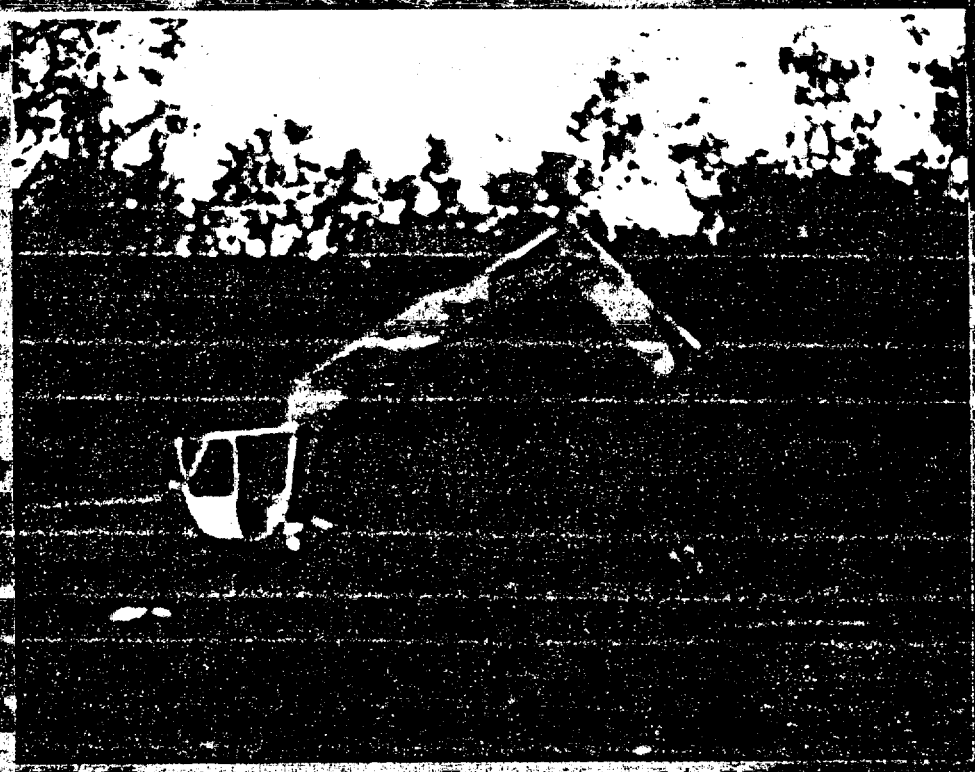

Photo 20-
Test Pit No. 8 (TP8)

300335

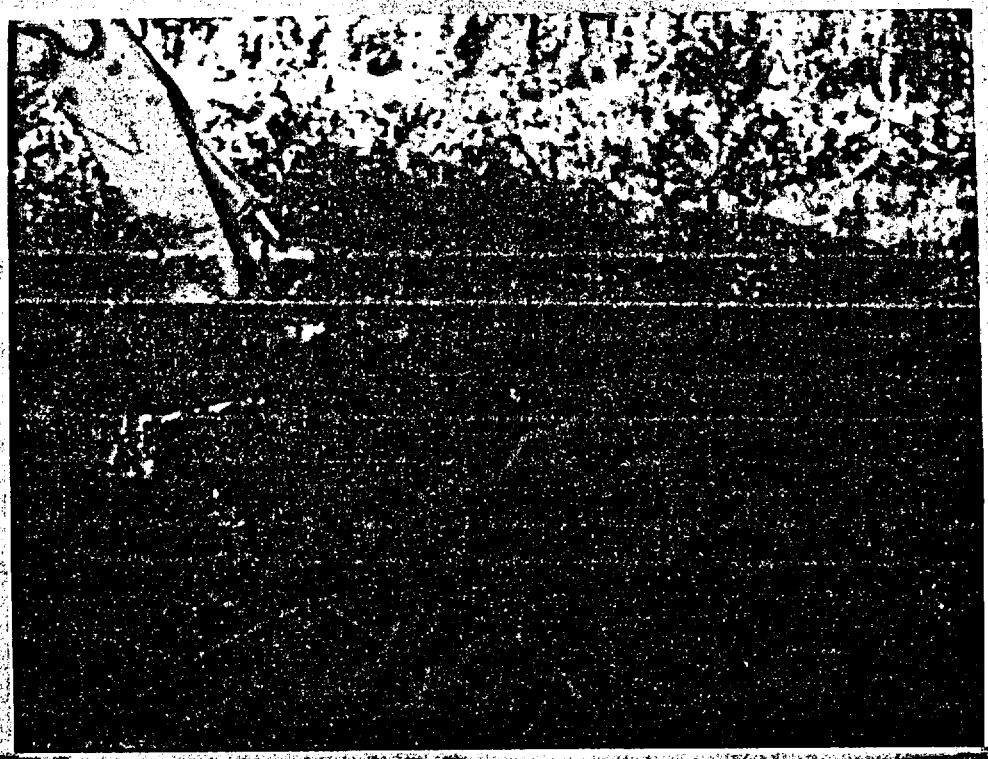

Photo 21-
Test Pit No. 12 (TP12)

Photo 22-
Test Pit No. 12 (TP12)

300336

Photo 23-
TP12 Sample

Photo 24-
Pond No. 1 (P1)

300337

Photo 25-
Test Pit No. 13 (TP13)

Photo 26-
Spilled Waste From Drum No.1

300338

Photo 27-
Drum No. 2

Photo 28-
View of Overpacking Exavated Drum

Photo 29-
Overpacking of Unearthed Drum.

Photo 30-
Test Pit No. 14 (TP14)

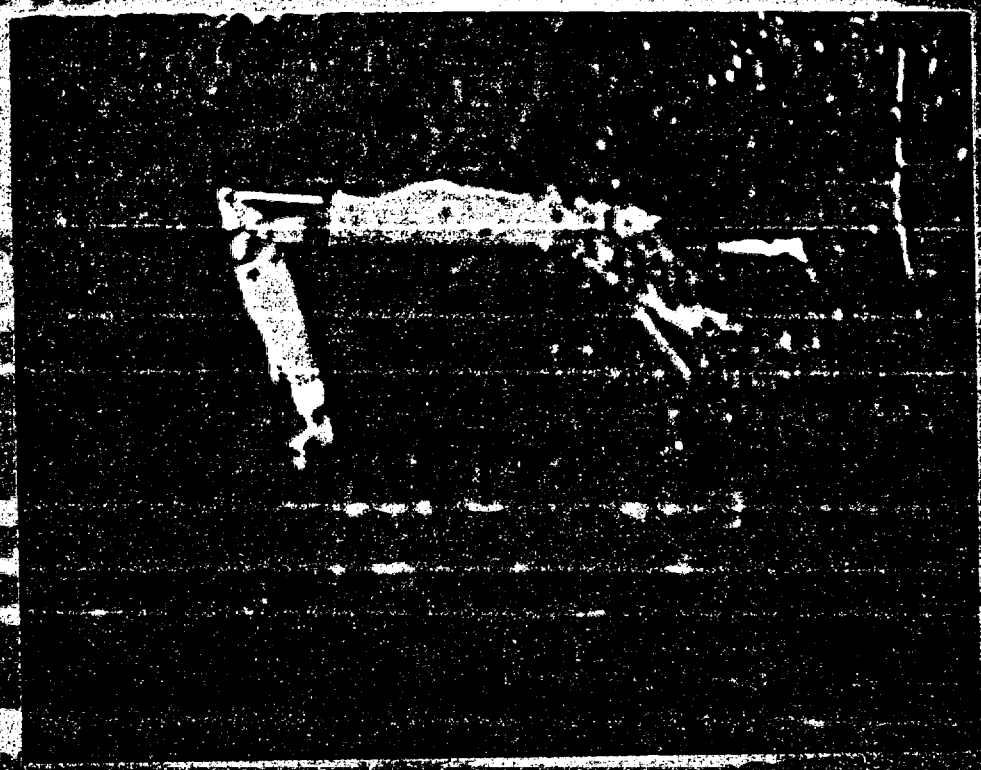

Photo 31-
Test Pit No. 15 (TP15)

300341

Photo 32-
Drum Removed From TP15

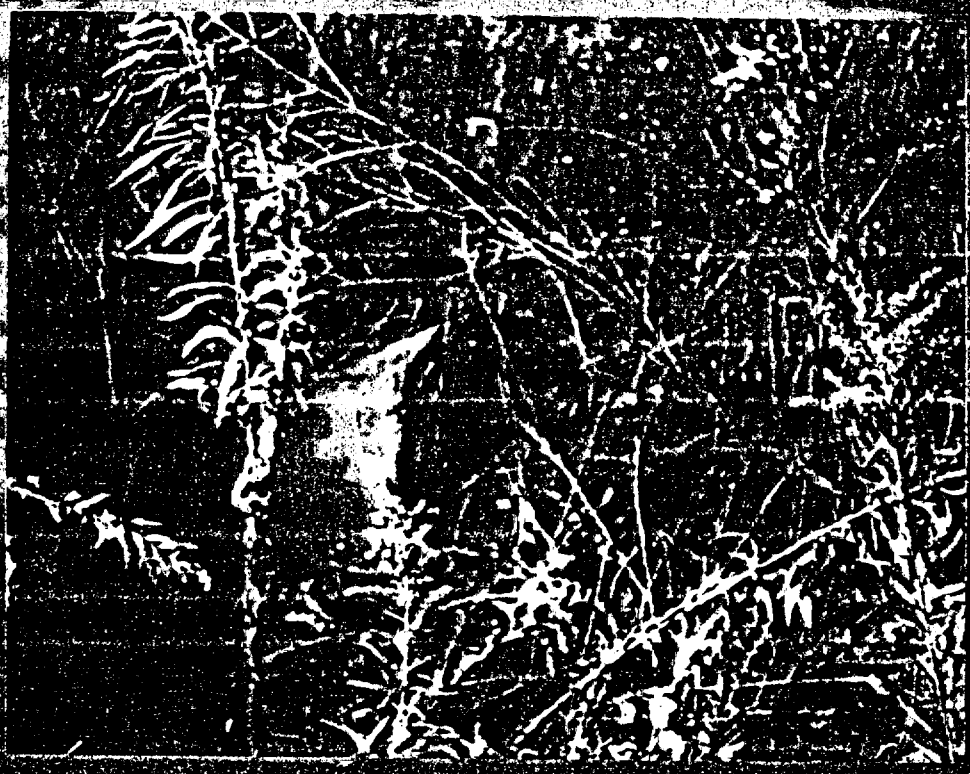

Photo 33-
Drum Adjacent To TP15

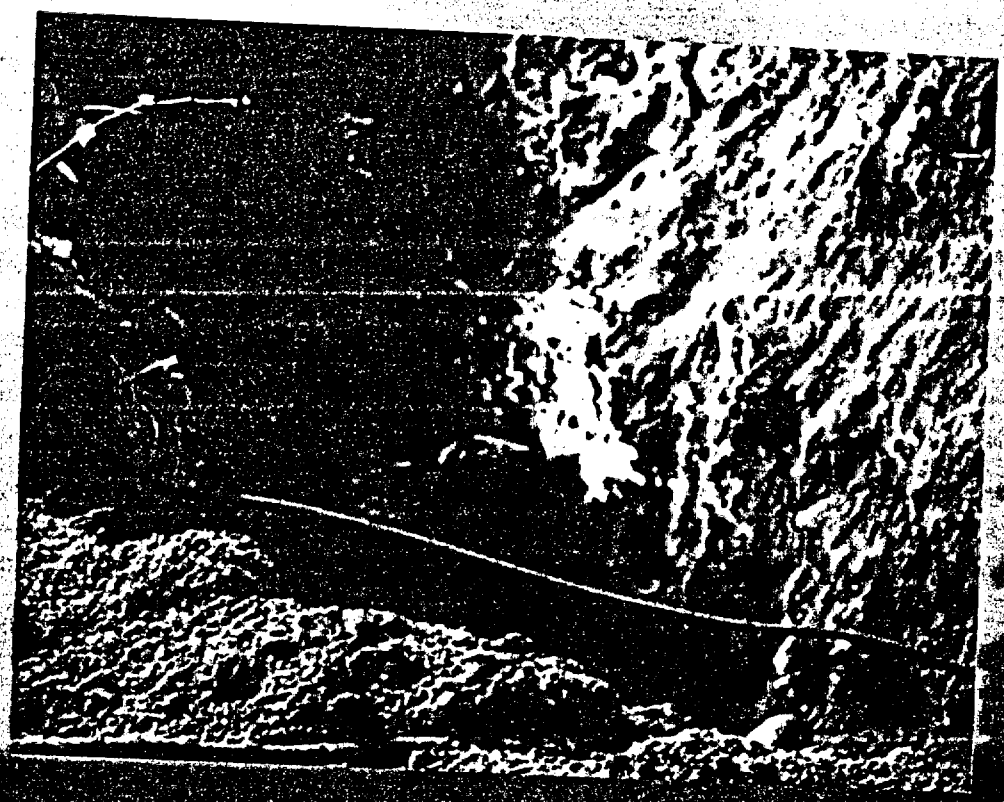

Photo 34–
Remnants of Drum in TP15

Photo 35–
Test Pit No. 16 (TP16)

300343

Photo 36-
Test Pit No. 17 (TP17)

Photo 37-
Test Pit No. 18 (TP18)

300344

Photo 38-
TP18 Sample

300345

Photo 39-
TP19 Sample

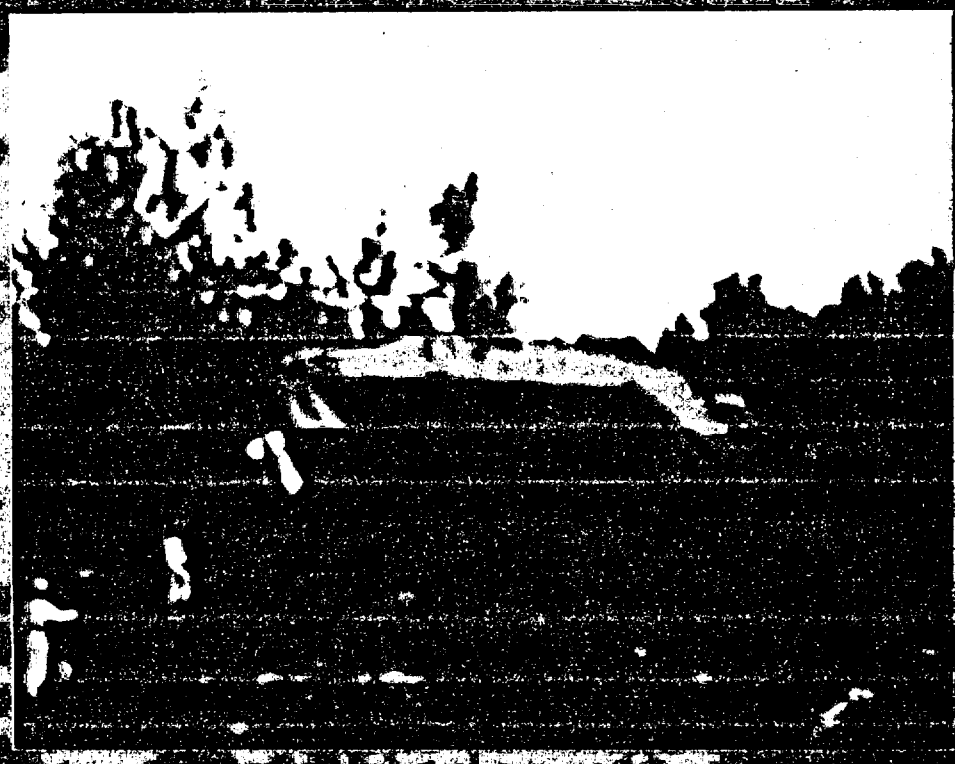

Photo 40-
Overpack Removal

Photo41-
Removing Overpack from Pond 2

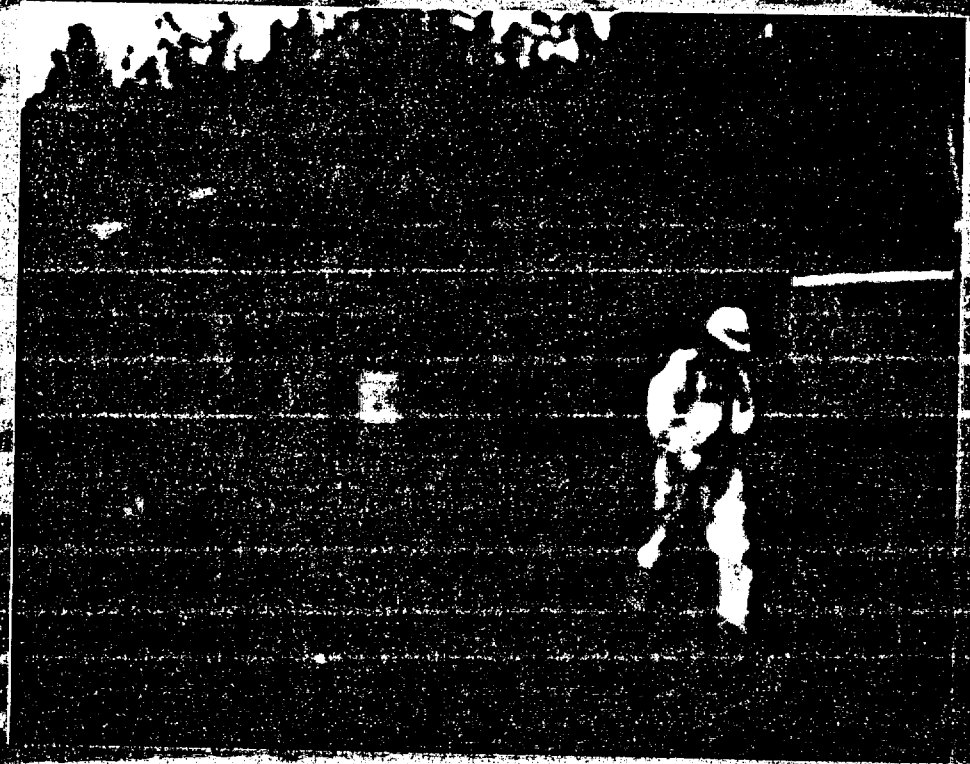

Photo 42-
Storage Area for Overpacks

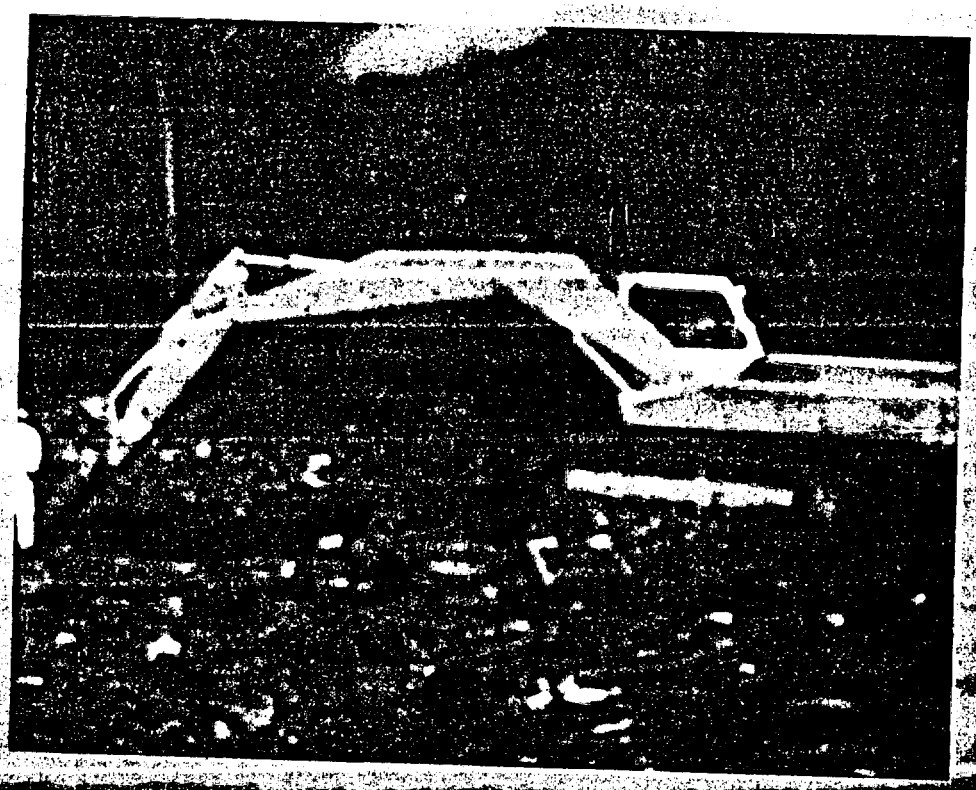

Photo 43-
Excavation of Pond No. 2; Pit 1

Photo 44-
Excavation of Pond No.2; Pit1

300348

Photo 45-
Pond No.2, Pit NO.2

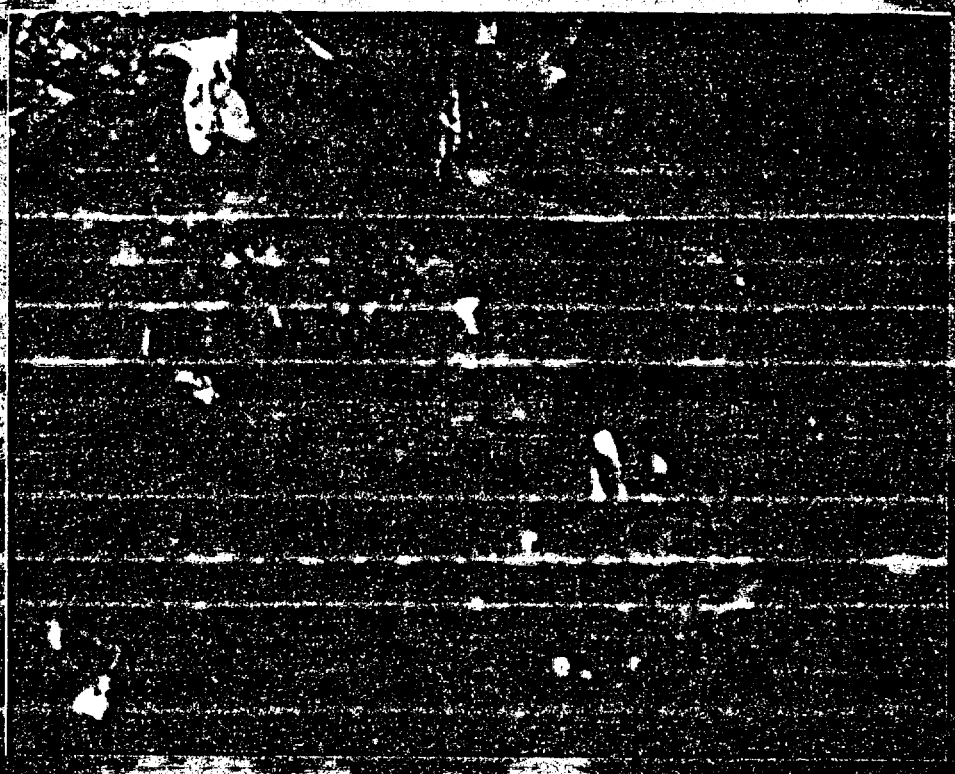

Photo 46-
View of Pit No.2

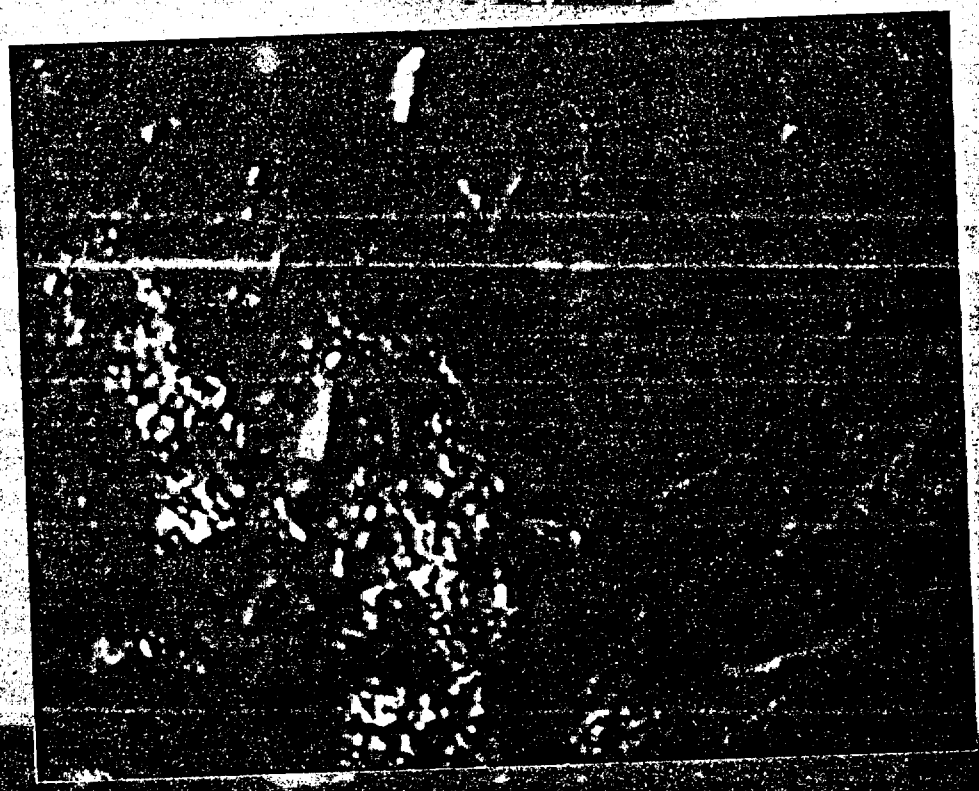

Photo 47-
Pit No.2 with Groundwater Infiltration

Photo 48 –
Pond No.2 Pit No.3

300350

Photo 49-
Test Pit No.19 (TP19)

300351

Photo 50-
Lw4

Photo 51-
Lw3

300352

Photo 52-
Lw2

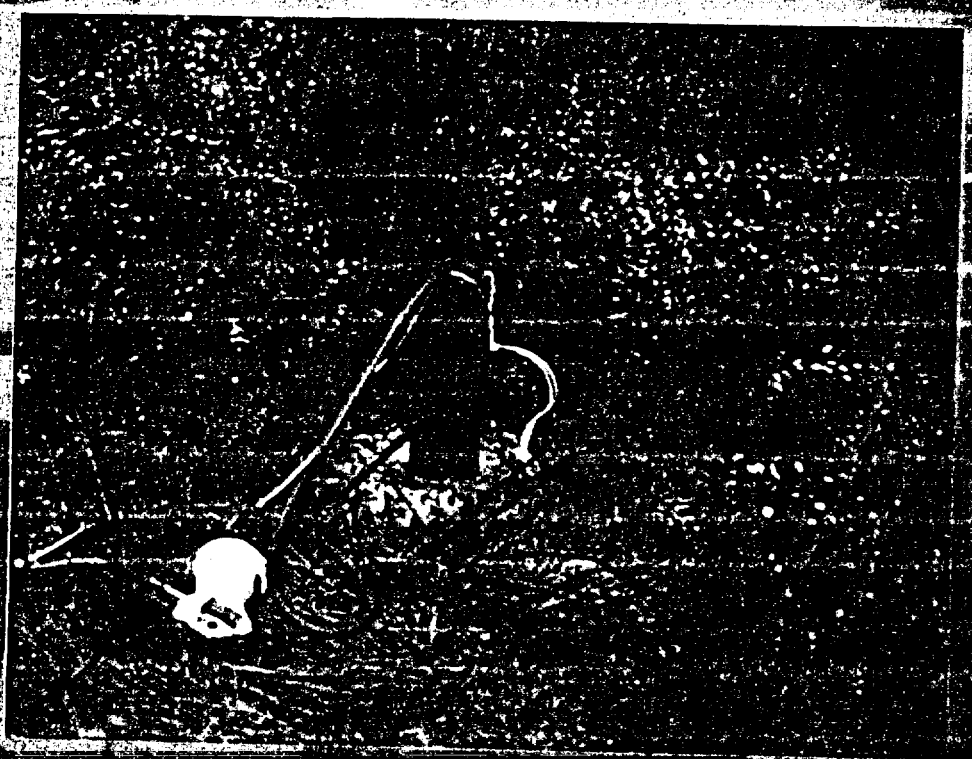

Photo 53-
Lw2

300353

Photo 54-
Sampling LW2

Photo 55-
Sampling LW1

300354

Photo 56-
Sampling S-6

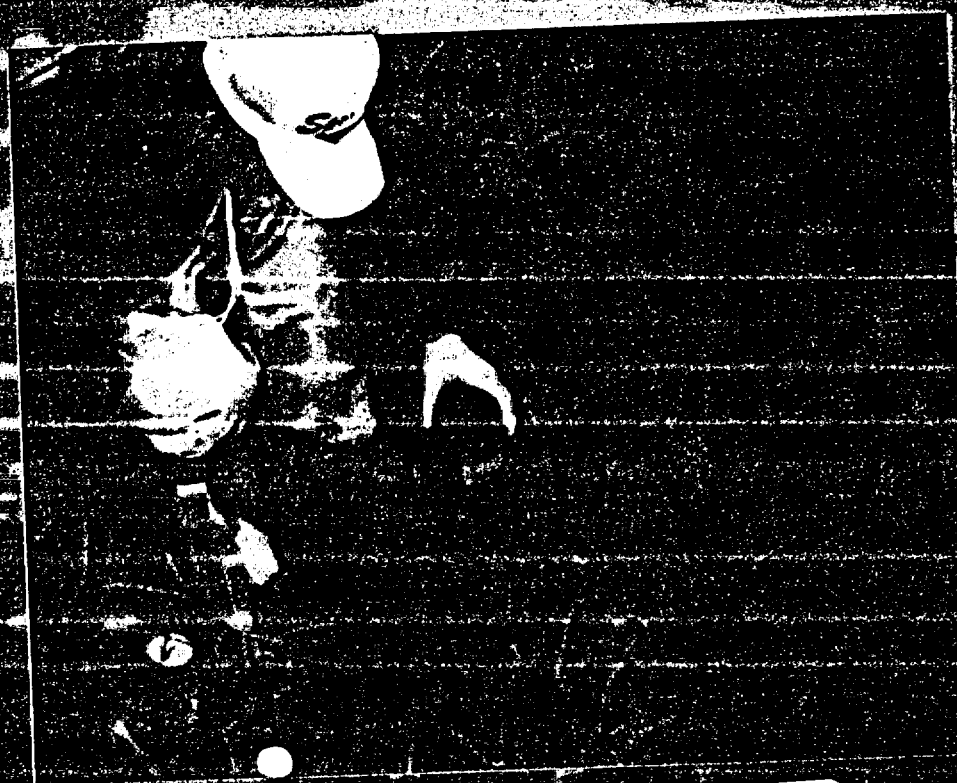

Photo 57-
Sampling S-5

300355

Photo 58-
Sampling Point S-7A

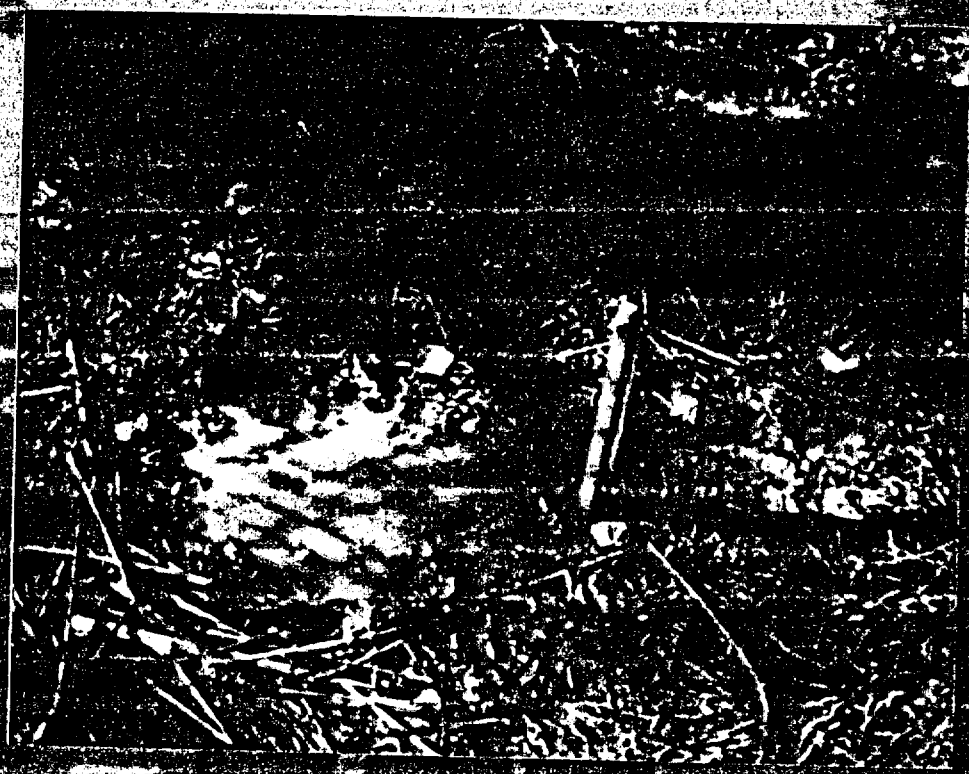

Photo 59-
Sampling Point S-4

Photo 60-
Sampling Point S-4A

Photo 61-
Sampling Point S-7

300357

Photo 62-
Sample Location S8(1"-6")

Photo 63-
Sample Location S8A(6"-12"Auger)

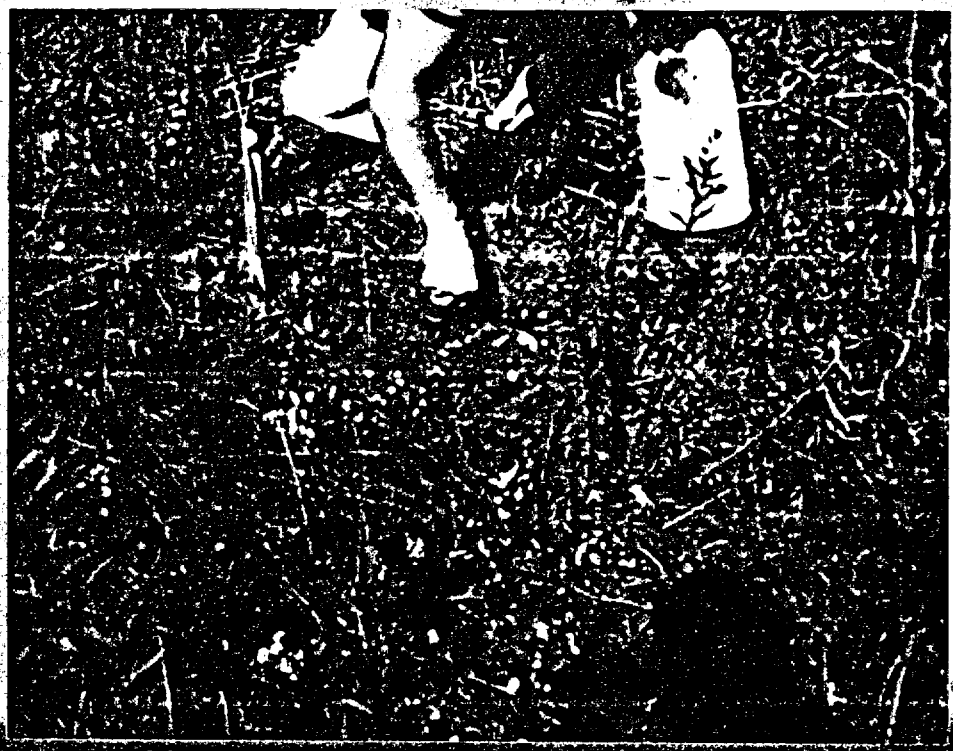

Photo 64-
Sample Location S8(1"-6"

Photo 65-
Sample Location S8(6"-12"Auger)

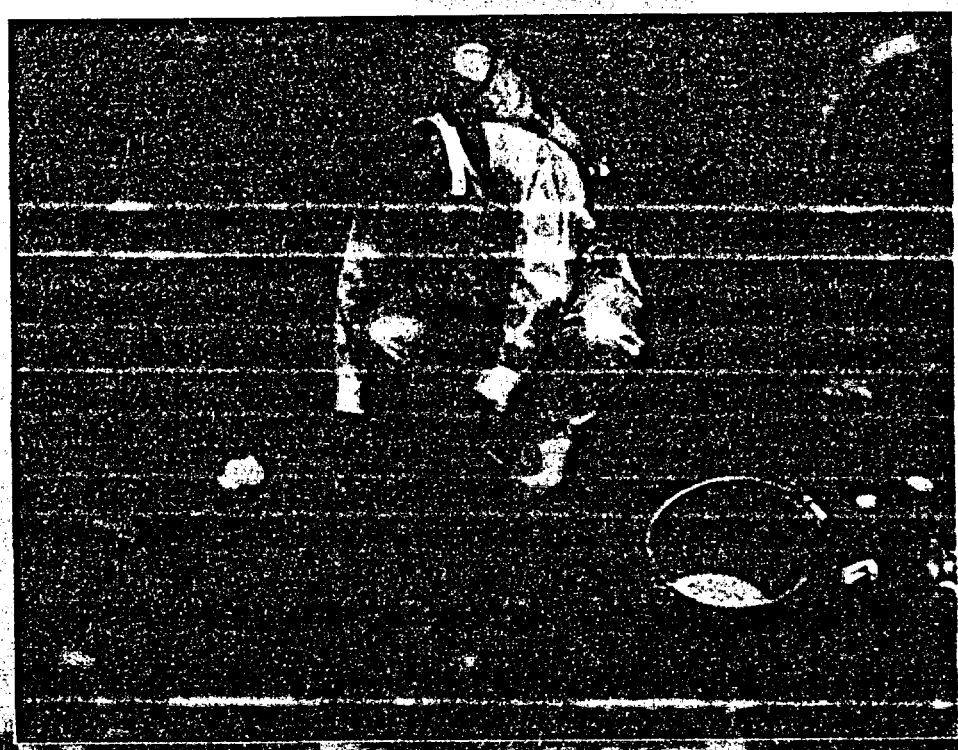

Photo 66-
Sample Location S-3(1"-6")

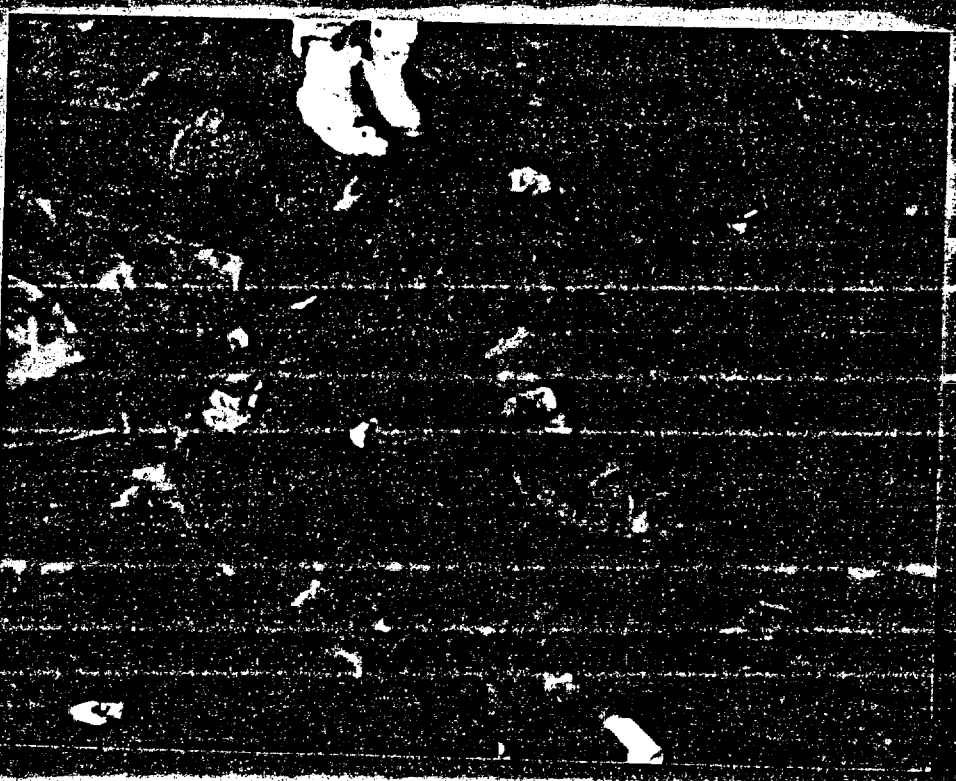

Photo 67-
Sample Location S-3(6"-12"Auger)

300360

SECTION 3

3.0 LABORATORY DATA

3.1 Sample Data Summary

GLOSSARY

Data Summary Footnotes

In the data summary which follows, data qualifier code letters are associated with these definitions:

◊	This concentration reported by laboratory, but evidence to doubt presence of compound/element (may or may not be present).
J	Approximate value; detected below limit of accurate quantitation.
[ ]	Value is greater than or equal to the instrument detection limit, but less than the contract required reporting limit.
UF	The material was analyzed for, but was not detected. The associated numerical value is the estimated sample quantitation limit.
F	The associated numerical value is an estimated quantity because quality control criteria were not met. (See Quality Assurance Review for specifics as to magnitude or direction of variability or bias.)
R	Quality Control indicates that data are unusable (compounds may or may not be present). Resampling and/or reanalysis is necessary for verification.
N	Evidence for presence of material is presumptive (tentative identification).

3.2 Quality Assurance Review

3.2.1 Organic Data: Lab Case 5027

3.2.1.1 Introduction

The organic analyses of samples for this case were performed by 4 Contract Laboratory Program (CLP) laboratories which performed analyses on 40 solid samples and 7 aqueous samples. The findings offered in this report are based upon a general review of all available data, blank results, surrogate and matrix spike recoveries, field duplicate analysis results, evaluation of GG confirmations, target compound matching quality, calibrations, and tentatively identified compounds.

3.2.1.2 Qualifiers

It is recommended that this data package be utilized only with the following qualifier statements:

- All positive results for methylene chloride, acetone, 2-butanone, di-n-butyl phthalate, and bis(2-ethylhexyl) phthalate are questionable.
- The positive results for toluene in samples C5758-11, C5758-12, C5626-12, and CC393 are questionable.
- The positive result for benzene in sample CC375 is questionable.
- The positive results for gamma-BHC in sample CC349, beta-endosulfan in sample CC383, and dieldrin and 4,4'-DDE in sample CC384 are questionable.

The aforementioned compounds cannot be assumed present, based upon this analysis, as data contain direct evidence to doubt their presence. (They may or may not be present.) Generally, these data are best used to demonstrate that substantially greater levels of environmental contamination do not exist in the above sample results.

- Although there is no direct reason to question the positive results for carbon tetrachloride in samples CC373, CC374, CC375, CC376, CC378, CC379, CC380, and CC382, these results have been designated presumptive.

- All positive VOA results (and detection limits) for samples CC386, CC387, CC388, CC390, CC391, CC392, and CC393 may be higher than reported. (Although, all positive results for methylene chloride, acetone, and 2-butanone were questioned in these samples, if any of the compounds are actually present, the concentrations could be higher than reported.)

- Although there is not direct evidence to question trichloroethene and toluene in samples CC390 and CC391, it is not possible to adequately verify these results are not artifactual.

- All positive VOA results (and VOA and BNA detection limits), for samples C5758-11, C5758-12, and C5626-12, may be higher than reported. In particular, the detection limits for "light" VOA compounds in these samples (i.e., chloromethane, bromomethane, vinylchloride and chloroethane) may be substantially higher than reported. (Although methylene chloride, acetone, and toluene were questioned in these samples, if any of these compounds are acutally present, the concentration may be higher than reported.)

- Due to insufficient sample volume BNA and pesticide/PCB analysis was not performed on sample CC366.

- The quantitation of all positive results for samples CC365, CC366, CC367, CC368, and CC372 are incorrect as reported by the laboratory. The corrected results have been incorporated into the sample data summary.

- The laboratory did not report the confident presence of PCB-1254 at an estimated concentration of 1,600 ug/kg in sample CC387. This result has been added to the sample data summary.

- The reported results of benzo(b)fluoranthene in samples CC349, CC352, CC353, and CC384 may actually represent the presence of either this isomer or benzo(k)fluoranthene or both compounds.

- The reported concentration of toluene in sample CC378 should be considered estimated. (The same can be said for carbon tetrachloride in the sample if this compound is presumed to be present.)

- The reported concentration of total xylenes in sample CC366 should be considered estimated.

- The positive results for pyrene in samples CC382 and CC384 should be considered estimated.

- Although dieldrin and 4,4'-DDE were questioned in sample CC384, if either compound is present, the concentration may be lower than reported.

- Although 2-butanone was questioned in samples CC348, CC350, CC351, CC352, CC353, CC354, CC355, CC356, CC357, CC358, CC361, CC362, CC363, CC373, CC374, CC375, CC376, CC378, CC379, CC380, CC381, CC382, CC383, and CC385, if 2-butanone is present in any of these samples, the reported concentrations should be considered estimated.

- The actual detection limits for all pesticides in samples CC373, CC374, CC377, CC378, CC380, and CC381 may be substantially higher than reported. This is particularly true for endrin in sample CC374.

- The actual detection limit for most acid compounds in samples CC365 and CC368 may be substantially higher than reported.

- The actual detection limit for 1,2,4-trichlorobenzene in samples CC376 and CC354 may be slightly higher than reported.

- The actual detection limit for 4-nitrophenol in samples CC365, CC366, CC367, CC368, and CC372 may be substantially higher than reported.

- The reported detection limit for 4,4'-DDT may be slightly higher than reported for samples CC373, CC377, CC378, CC380, CC384, CC352, CC353, CC362, and CC381.

- The reported detection limits for vinyl acetate, dichlorobromomethane, 2-chloroethylvinyl ether, and 4-methyl-2-pentenone are unreliable and may be substantially higher than reported for samples CC348, CC349, CC350, CC351, CC352, CC353, CC354, CC355, CC356, CC357, CC358, CC360, CC361, CC362, CC363, CC373, CC374, CC375, CC376, CC377, CC378, CC379, CC380, CC381, CC382, CC383, and CC384.

- The reported detection limits for 2-butanone are unreliable and may be substantially higher than reported for samples CC349, CC360, CC377, and CC384.

- The reported detection limits for 4-chloroaniline and 3-nitroaniline for samples C5758-11, C5758-12, and C5626-12 are unreliable and may be substantially higher than reported.

- The reported detection limits for 4-chlorophenylphenyl ether are unreliable and may be substantially higher than reported for samples CC365, CC366, CC367, CC368, and CC372.

- Tentatively identified compounds of confident matching quality which are not documented artifacts are presented immediately following this Quality Assurance Review. In particular, several samples revealed high concentrations of alkylbenzenes.

3.2.2.3 Findings

- Field and/or laboratory blank analysis revealed the presence of methylene chloride, acetone, 2-butanone, toluene, benzene, di-n-butyl phthalate, and bis(2-ethylhexyl) phthalate at sufficient concentrations to question the aforementioned sample results for these compounds. In particular, many results for methylene chloride, acetone, 2-butanone, and toluene which appear to be very high results actually represent low instrument concentrations multiplied by large dilution factors. These instrument values were all within 10 times of their associated blanks and therefore were questioned.

- The presence of toluene was questioned in sample CC393, since this sample was analyzed immediately after a matrix spike which contains toluene. As a result, there is a strong possibility this low-level result may be an artifact of instrument carry-over.

- All positive results for gamma-BHC, beta-endosulfan, dieldrin, and 4,4'-DDE were questioned because these low-level identifications depend on a single peak response on dual GC cloumns. These responses may be artifacts of random chromatographic interferences.

- The presence of carbon tetrachloride in medium-level samples CC373, CC374, CC375, CC376, CC378, CC379, CC380, and CC382 may be suspect and those results were designated presumtive for the following reasons:

  -Carbon tetrachloride was reported in 8 of the 9 medium-level samples analyzed by one laboratory and a required methanol extracted reagent blank used to monitor laboratory reagent contaminants of the medium level protocol was not provided by the laboratory.

  -Carbon tetrachloride was not reported present even at trace concentrations in any of the other 36 samples analyzed for this case. Furthermore, medium-level sample CC378 was sent to a second laboratory as an inter-laboratory field duplicate. This second laboratory analyzed this sample as a low-level sample, which is approximately 56 times more sensitive than the medium protocol. The second analysis, even with their better sensitivity, did not detect the presence of carbon tetrachloride. As a result, carbon tetrachloride may be an artifact of the methanol extraction procedure, but this cannot be verfied.

- The maximum holding times prior to VOA analysis were exceeded by 2 to 8 days for solid samples CC386, CC387, CC388, CC390, CC391, CC392, and CC393.

- Field blank CC394 was actually an aqueous blank used to monitor laboratory introduced contaminants during solid sample storage and sample analysis. Per instruction from SMO, this blank was not analyzed. This is unfortunate since contaminants can be introduced during solid sample storage, particularly since maximum holding times for VOAs were exceeded. The associated samples that went to this laboratory are samples CC386, CC387, CC388, CC390, CC391, CC392, and CC393. Thus, one could not rule out the possibility that the results for trichloroethene and toluene in samples CC390 and CC391 are not the result of organic vapor permeation during solid sample storage.

- Due to problems with scheduling laboratory space for high hazard samples C5758-11, C5758-12, and C5626-12, the VOA analyses of these samples were not performed until 60 days after sample collection. Similarly, the BNA extraction of these samples was not performed until 58 days after sample collection.

- The laboratory which performed analysis on samples CC365, CC366, CC367, CC368, CC370, and CC372 did not use the response factors from the associated daily calibration standard for quantitating results. The use of these updated response factors is required and the reviewer has requantitated these results using the proper response factors.

- Although the concentration of PCB-1254 in sample CC387 was below the laboratory's reported detection limit, the reviewer has added this indentification so an appropriate evaluation of Aroclor contamination can be assessed.

- Comparison of samples CC349, CC352, CC353, and CC384 with the associated calibration standard revealed benzo(b)fluoranthene and benzo(k)fluoranthene are indistinguishable since they have identical retention times (for these samples) and identical spectra.

- The analyses of inter-laboratory duplicates CC378 and CC386 revealed poor precision for toluene (and carbon tetrachloride).

- The result for total xylene in sample CC366 should be considered estimated since the quantitation was based upon an undiluted sample aliquot and the concentration is markedly above calibration range. The laboratory should have performed a dilution to adequately quantitate xylenes in this sample.

- Examination of the relative response factor for the continuing calibration standard associated with samples CC382 and CC384 revealed a high percent difference for pyrene compared to the intial 5-point calibration.

- High recovery was reported for the pesticide surrogate compound in sample CC384. As a result, although the presence dieldrin and 4,4-DDE were questioned, if these compounds are present the concentration may be lower than reported. In addition, the calibration factor used for the quantitation of dieldrin in this sample revealed a high percent difference compared to the calibration factor previously established.

- Very low relative response factors (below 0.05) were used to quantitate 2-butanone in the aforementioned samples. Although all results were questioned due to blank contamination, if this compound is present, the reported concentrations should be considered estimated.

- Zero or very low recoveries were reported for the pesticide surrogate compound for samples CC373, CC374, CC377, CC378, CC380, and CC381. In addition, zero recovery was reported for the matrix spike compound endrin in sample CC374.

- Very low recoveries were reported for 2 of the 3 acid surrogate compounds in both the initial and re-extraction of samples CC365 and CC368.

- Low recoveries were reported for the matrix spike compound 1,2,4-trichlorobenzene in samples CC376 and CC354.

- The laboratory which performed analysis on field blank CC369 used this blank for VOA, BNA, and pesticide matrix spike purposes. Very low recoveries were reported for the matrix spike compound 4-nitrophenol. Since this is a relatively "clean" matrix, it is a safe assumption that similar (or worse) recoveries would be obtained from "environmental" samples CC365, CC366, CC367, CC368, and CC372 if they were selected.

- The pesticide standard associated with samples CC373, CC377, CC378, CC380, CC384, CC352, CC353, CC362, and CC381 revealed a slightly high (above 20 percent) breakdown for 4,4'-DDT.

- Examination of the calibration standards associated with the aforementioned samples revealed a very low (below 0.05) relative response factors for vinyl acetate, dichlorobromomethane, 2-chloroethylvinyl ether, 4-methyl-2-pentanone, 2-butanone, 4-chloroaniline, 3-nitroaniline, and 4-chlorophenylphenyl ether.

3.2.1.4 Summary

The attached Quality Assurance Review has identified the aforementioned areas of concern. The text of this report has been formatted to address only those problem areas which affect the application of the data to the subject investigation. Documentation of these problems and also any observed areas of contractual noncompliance are included in the attached Support Documentation appendix to this report.

Report prepared by Rock J. Vitale (215) 687-9510 Rock J. Vitale Date: September 11, 1986

SAMPLE DATA SUMMARY: ORGANIC TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NUMBER	ANALYSIS FRACTION (VOA/BNA)	ESTIMATED CONCENTRATION VALUE	ESTIMATED CONCENTRATION UNITS	QUALIFIER CODE	COMPOUND NAME
					PAGE 1 of 6
CC348	VOA				ND
↓	BNA	13,500	ug/kg	TOTUNK	2 Unknowns
↓	↓	3,950	↓	TOT	Hydrocarbon matrix
CC349	VOA				ND.
	BNA	900	ug/kg	ISO	1,3-dimethyl-naphthalene
	↓	2800	↓	UNK	Unknown contains oxygen.
↓	↓	44,310	↓	TOT	Total Hydrocarbon matrix
CC350	VOA				ND
↓	BNA	590	ug/kg		hexadecanoic acid.
↓	↓	3840	↓	TOT	Total Hydrocarbon matrix
CC351	VOA				ND
↓	BNA	590	ug/kg	UNK	Unknown hydrocarbon
CC352	VOA				ND
↓	BNA	400	ug/kg	UNK	Unknown contains oxygen
↓	↓	1100	↓	UNK	Unknown (m/z:) 253
↓	↓	4100	↓		benzo [J] fluoranthene
↓	↓	2400	↓		perylene
↓	↓	2700	↓	UNK	2 Unknowns (m/z 191)
↓	↓	980	↓		dibenzo [DEF, MNO] chrysene
↓	↓	18,930	↓	TOT	Total Hydrocarbon matrix
CC353	VOA				N.D
	BNA	7500	ug/kg		benzo[J] fluoranthene
		12,000	ug/kg	TOT	total Hydrocarbon matrix
		26,800	ug/kg	TOTUNK	10 Unknowns

DEFINITIONS OF QUALIFIER CODES:

SUS = SUSPECTED FALSE POSITIVE RESULT: Compound is either a common laboratory contaminant, or else a possible reaction byproduct (artifact) attributable to the chemical reagents used for sample preparation and analysis. This result is suspect even though this compound was not found in any associated blanks.

UNK = UNKNOWN COMPOUND: Library search result unreasonable or of very low matching quality.

TOT = TOTAL CONCENTRATION REPORTED: Represents the sum of several compounds detected all belonging to the same chemical class.

ISO = OR ISOMER: Compound identification is not selective for this isomer only. This result may instead represent the presence of a similar compound comprised of the same atoms bonded together in a different arrangement or substitution pattern.

SAMPLE DATA SUMMARY: ORGANIC TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NUMBER	ANALYSIS FRACTION (VOA/BNA)	ESTIMATED CONCENTRATION VALUE	ESTIMATED CONCENTRATION UNITS	QUALIFIER CODE	5 cubed COMPOUND NAME PAGE 2 of 6
CC354	VOA				ND
↓	BNA	990	ug/kg	SUS	3,5-dimethyl-2-cyclohexen-1-one
↓	↓	1560	↓	TOT	Total Hydrocarbon matrix
CC355	VOA				ND
↓	BNA	4790	ug/kg	TOT	Total Hydrocarbon matrix
↓	↓	1810	ug/kg	TOT	2 oxygenated hydrocarbons
CC356	VOA	303	ug/kg	UNK	Unknown m/z:47
↓	↓	7.0	↓	UNK	Unknown m/z:45
↓	BNA	480	↓	SUS	3,5-dimethyl-2-cyclohexen-1-one
↓	↓	670	↓	↓	2,6,6-trimethyl-bicyclo[3.1.1]hept-2-ene
↓	↓	370	↓	↓	hexadecanoic acid
↓	↓	3355	↓	TOT	Tot hydrocarbon matrix
↓	↓	1560	↓	TOTUNK	2 unknowns
CC357	VOA				ND
↓	BNA	470	ug/kg	↓	Sulfur (S8)
↓	↓	9620	↓	TOT	Total Hydrocarbon (aliphatic)
↓	↓	31,690	↓	TOT	Total oxygenated hydrocarbons
CC358	VOA				ND
↓	BNA	3590	ug/kg	TOT	Total Hydrocarbon matrix
CC360	VOA				ND
↓	BNA	1800	ug/kg	SUS	3,5-dimethyl-2-cyclohexen-1-one
↓	↓	580	↓	TOT	Total Hydrocarbon matrix

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ISO = OR ISOMER: Compound identification is not selective for this isomer only. This result may instead represent the presence of a similar compound comprised of the same atoms bonded together in a different arrangement or substitution pattern.

SAMPLE DATA SUMMARY: ORGANIC TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NUMBER	ANALYSIS FRACTION (VOA/BNA)	ESTIMATED CONCENTRATION VALUE	ESTIMATED CONCENTRATION UNITS	QUALIFIER CODE	5-cvoc COMPOUND NAME PAGE 3 of 6
CC361	VOA				ND
↓	BNA	750	ug/kg	Tot	Total Hydrocarbon matrix
CC362	VOA				ND
↓	BNA	1100	ug/kg	Unk	Unknown contains oxygen
↓	↓	5140	↓	Tot	Total Hydrocarbon matrix
CC363	VOA				N.D.
↓	BNA	1200	ug/kg	Unk	Unknown contains oxygen
↓	↓	4930	↓	Tot	Total Hydrocarbon matrix
CC373	VOA				ND
↓	BNA	750	ug/kg	Tot	Total Hydrocarbon matrix
CC374	VOA				N.D
	BNA	3200	ug/kg	ISO	1,2-dimethylbenzene (corobenters VOA)
		27,000	ug/kg	ISO	1,3-dimethylbenzene (" " ")
		510	ug/kg	ISO	(1-methylethyl)-benzene
		39,000	ug/kg	ISO	1,4-dimethylbenzene (confirms VOA)
		350	ug/kg	ISO	1-ethyl-3-methyl-benzene
		420	ug/kg	ISO	1,2,3-trimethylbenzene
		1300	ug/kg	ISO	1,3,5-trimethylbenzene
		340	ug/kg	ISO	1-methyl-n-propylbenzene
		600	ug/kg	ISO	1-ethyl-2,4-dimethylbenzene
		240	ug/kg		Sulfur (S8)
		2280	ug/kg	Tot	Total Hydrocarbon matrix
✓	✓	320	ug/kg	Unk	1 Unknown.

DEFINITIONS OF QUALIFIER CODES:

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SAMPLE DATA SUMMARY: ORGANIC TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NUMBER	ANALYSIS FRACTION (VOA/BNA)	ESTIMATED CONCENTRATION VALUE	ESTIMATED CONCENTRATION UNITS	QUALIFIER CODE	5-cubed · COMPOUND NAME PAH-polyaromatic hydrocarbon PAGE 4 of 6
CC375	VOA				ND
	BNA	3600	ug/kg	ISO	1,2-dimethylbenzene (confirms VOA)
		1400			Sulfur (SE)
		1100			benzo[b]naphtho[2,1-D]thiophene
		1500			benzo[c]phenanthrene
		910		Unk	Unknown PAH
		1200		ISO	3-methylchrysene
		870		Unk	Unknown PAH
		2900		Unk	Unknown PAH
		11,000		Unk	Unknown PAH
		6,300		Unk	Isomer of benzo(a)pyrene
		29,000			benzo[J]fluoranthene
		9,000			perylene
		4,200		Unk	Unknown PAH
		3,000			pentacene
		3,700		ISO	benzo(b)chrysene
		9,900			dibenzo[DEF,MNO]chrysene
CC376	VOA				ND
	BNA	300	ug/kg	SUS	3,5-dimethyl-2-cyclohexen-1-one
		590			ethylbenzene (confirms VOA)
		3800			xylenes (" ")
		4100			xylenes (" ")
		9,090		TOT	total Hydrocarbon matrix
		890		Unk	2-Unknowns
CC377	VOA				N.D
	BNA	6,200	ug/kg	SUS	1-methyl-2-propyl-cyclohexane
		3200		ISO	1-ethyl-2,3-dimethyl benzene

DEFINITIONS OF QUALIFIER CODES:

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UNK = UNKNOWN COMPOUND: Library search result unreasonable or of very low matching quality.

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ISO = OR ISOMER: Compound identification is not selective for this isomer only. This result may instead represent the presence of a similar compound comprised of the same atoms bonded together in a different arrangement or substitution pattern.

PROJECT NAME: Osborne Disposal.
TDD NO: F3-8508-37

EPA SITE NO.: PA681
REGION: E.T III

QUALITY ASSURANCE REVIEW OF ORGANIC ANALYSIS LAB DATA PACKAGE

Case No.: 5027
Contract No.: 68-01-7021
Contract Laboratory: S-cubed
Applicable IFB No.: WA84-A267
Reviewer: Rock J. Vitale
Review Date: 2/8/86

Applicable Sample No's.: CC348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 360, 361 362, 363, 373, 374, 375, 376 377, 378, 379, 380, 381, 382, 383, 384, CC385, 371, 389,

The organic analytical data for this case has been reviewed. The quality assurance evaluation is summarized in the following table:

Reviewer's Evaluation*	Fraction				
	VOLATILES	ACIDS	BASE/ NEUTRALS	PCB/ PEST.	TCDD
Acceptable		✓			
Acceptable with exception(s)	✓#1,#4,#6,#7,#8		✓#1,#2,#4,#9	✓#2#3,#5	Not Analyzed
Questionable					
Unacceptable					

* Definitions of the evaluation score categories are listed on next page.

This evaluation was based upon an analysis of the review items indicated below:

- ● DATA COMPLETENESS
- ● BLANK ANALYSIS RESULTS
- ● SURROGATE SPIKE RESULTS
- ● MATRIX SPIKE RESULTS
- ● DUPLICATE ANALYSIS RESULTS
- ● EVALUATION OF CONFIRMATIONS
- ǂ ● QUANTITATIVE CALCULATIONS
- ● TARGET COMPOUND MATCHING QUALITY
- ● TENTATIVELY IDENTIFIED COMPOUNDS
- ǂ ● CHROMATOGRAPHIC SENSITIVITY CHECKS
- ǂ ● DFTPP AND BFB SPECTRUM TUNE RESULTS
- ● STANDARDS
- ● CALIBRATION CHECK STANDARDS
- ǂ ● HOLDING TIMES

Data review forms are attached for each of the review items indicated above.
ǂ No errors noted, no form attached.
◒ Spot Check performed.

Comments: #1 Please see blank analysis documentation.
#2 Please see matrix spike recoveries.
#3 Please see surrogate spike recoveries
#4 Please see calibrations (estimates by > 20 D, Low RFs)
#5 Please see pesticide standards (by > % breakdown, and by > 20 D for cal factors).
#6 The results for carbon tet in medium VOA may be artifactual
#7 No medium VOA reagent blk was submitted
#8 Please see inter-lab/duplicate results.
#9 Benzo(b)e(k)fluoranthene in CC349, 352, 353 & 38f indistinguishable.

300376

SAMPLE DATA SUMMARY: ORGANIC TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NUMBER	ANALYSIS FRACTION (VOA/BNA)	ESTIMATED CONCENTRATION VALUE	UNITS	QUALIFIER CODE	S-cubed COMPOUND NAME PAGE 5 of 6
CC377	BNA	9,000	ug/kg	ISO	2-ethyl-1,3-dimethylbenzene
(cont)	|	3300	|	UNK	Unknown alkylbenzene
|	|	3400	|	ISO	1,2,3,4-tetramethylbenzene
↓	↓	188,400	↓	TOT	Total aliphatic hydrocarbons.
CC378	VOA				ND
	BNA	50,000	ug/kg	TOT	Total Aliphatic hydrocarbons.
CC379	VOA				ND
|	BNA	4000	ug/kg	SUS	3,5-dimethyl-2-cyclohexen-1-one
|	|	74,000	ug/kg		4-methyl-3-pentanoic acid
|	|	3,900	ug/kg	UNK	Unknown hydrocarbon
|	|	31,500	ug/kg	TOTUNK	Unknown oxygenated hydrocarbons
↓	↓	75,500	ug/kg	TOTUNK	9-unknowns
CC380	VOA				ND
	BNA				ND
CC381	VOA				ND
	BNA				ND
CC382	VOA	4500	ug/kg	TOT	6-unknowns
|	BNA	1000	|	ISO	2-methyl-triphenylene
|	|	3800	|	ISO	Benz[E]acephenanthrylene
|	|	11,000	|		Benzo[J]fluoranthene
|	|	5,600	|		perylene
|	|	2,600	|		Benz[J]aceanthrylene
|	|	31,600	|	TOT	Total Hydrocarbon matrix
↓	↓	16,000	↓	TOTUNK	5-unknowns

DEFINITIONS OF QUALIFIER CODES:

SUS = SUSPECTED FALSE POSITIVE RESULT: Compound is either a common laboratory contaminant, or else a possible reaction byproduct (artifact) attributable to the chemical reagents used for sample preparation and analysis. This result is suspect even though this compound was not found in any associated blanks.

UNK = UNKNOWN COMPOUND: Library search result unreasonable or of very low matching quality.

TOT = TOTAL CONCENTRATION REPORTED: Represents the sum of several compounds detected all belonging to the same chemical class.

ISO = OR ISOMER: Compound identification is not selective for this isomer only. This result may instead represent the presence of a similar compound comprised of the same atoms bonded together in a different arrangement or substitution pattern.

SAMPLE DATA SUMMARY: ORGANIC TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NUMBER	ANALYSIS FRACTION (VOA/BNA)	ESTIMATED CONCENTRATION VALUE	UNITS	QUALIFIER CODE	COMPOUND NAME (Scribed) PAGE 6 of 6
CC383	VOA	30,000	ug/kg	TOT Unk	9-unknowns
	BNA	47,000	J		butyl-cyclohexane
		3,500		ISO	1-methyl-4-propylbenzene
		28,000		ISO	1-methyl-4-(1-methylethyl)-benzene
		42,000			Benzo[J]fluoranthene
↓	↓	577,000	↓	TOT	Total Hydrocarbon matrix
CC384	VOA				ND.
	BNA	94,000	ug/kg	TOT	Total xylenes (listed as corroborating evidence)
		76,000		ISO	1,2,4-Trimethylbenzene
		53,000		ISO	4-ethyl-1,2-dimethylbenzene
		87,000			benzo[J]fluoranthene
↓	↓	873,000	↓	TOT	Total Hydrocarbon matrix
CC385	VOA				ND
	BNA	320	ug/kg		hexadecanoic acid
		970	J	Unk	Unknown alcohol or diene
		280			decane
↓	↓	2000	↓	TOT Unk	3-unknowns.

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ISO = OR ISOMER: Compound identification is not selective for this isomer only. This result may instead represent the presence of a similar compound comprised of the same atoms bonded together in a different arrangement or substitution pattern.

SAMPLE DATA SUMMARY: ORGANIC TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NUMBER	ANALYSIS FRACTION (VOA/BNA)	ESTIMATED CONCENTRATION VALUE	UNITS	QUALIFIER CODE	SRI Laws COMPOUND NAME PAGE 1 of V
CC365	VOA	210	ug/L	ISO	1-ethyl-2-methyl-benzene.
		1100	ug/L	ISO	nonane.
		280	ug/L	ISO	tridecane
		210	ug/L	ISO	1-methyl-3-(1-methylethyl)-benzene.
		440	ug/L	UNK	Unknown m/z 55.
	↓	660	ug/L	UNK	Unknown. hydrocarbon.
	BNA	21	ug/L	UNK	Unknown hydrocarbon.
		26	ug/L	UNK	Unknown m/z :72
		9.9	ug/L	UNK	Unknown m/z 81
		16	ug/L		Caprolactam (hexahydro-2H-azepin-2-one)
↓	↓	7.8	ug/L	UNK	Unknown m/z :53
CC366	VOA	63	ug/L	UNK	Unknown m/z 81.
		55			ethyl-cyclohexane.
		73		ISO	(2-methylbutyl)-cyclopentane.
		81		UNK	Unknown m/z 67.
		150		ISO	trans-1-ethyl-4-methyl-cyclohexane
		210		UNK	Unknown m/z 55
		52		ISO	1-dodecanol.
		340		UNK	Unknown m/z 69.
	↓	480		ISO	3-methyl-octane
↓	BNA	— not analyzed			
CC367	VOA.				ND.
	BNA	6.0	ug/L	UNK	Unknown. m/z :54
		2.4	ug/L	UNK	Unknown m/z :35
		5.4	ug/L	UNK	Unknown m/z 112
		5.0	ug/L	UNK	Unknown m/z 113
		14.0	ug/L	UNK	Unknown m/z 129.

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UNK = UNKNOWN COMPOUND: Library search result unreasonable or of very low matching quality.

TOT = TOTAL CONCENTRATION REPORTED: Represents the sum of several compounds detected all belonging to the same chemical class.

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SAMPLE DATA SUMMARY: ORGANIC TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NUMBER	ANALYSIS FRACTION (VOA/BNA)	ESTIMATED CONCENTRATION VALUE	ESTIMATED CONCENTRATION UNITS	QUALIFIER CODE	SRI-GCMS COMPOUND NAME PAGE 2 of 2
CC368	VOA				ND
	BNA	42	ug/l	Unk	Unknown m/z 67
		27	ug/l		hydrocarbon such as 17-pentatriacontene
		28	ug/l	Unk	Unknown hydrocarbon.
		31	ug/l	Unk	Unknown m/z 56.
		6.0	ug/l	Unk	Unknown m/z 81
		15	ug/l		Caprolactam.
		83	ug/l	Unk	Unknown m/z 40
CC372	VOA				ND.
	BNA	130	ug/l		Xylenes - verify as VOA.
		140	ug/l		1-ethyl-2-methyl benzene.
		110	ug/l	ISO	1,3,5-trimethyl benzene.
		32	ug/l	ISO	(1-methylethyl) benzene.
		350	ug/l	ISO	1,2,3-trimethylbenzene
		180	ug/l	ISO	1,2,4-trimethylbenzene
		27	ug/l	ISO	2,3-dihydro-1H-Indene.
		43	ug/l	ISO	1-methyl-4-propyl benzene.
		51	ug/l	ISO	1-ethyl-2,4-dimethyl benzene
		21	ug/l	ISO	(1-methyl-3-butenyl) benzene
		57	ug/l	ISO	2-ethyl-1,4-dimethyl benzene
		5.4	ug/l	ISO	1-methyl-4-(1-methylethyl) benzene.
		8.6	ug/l	Unk	Unknown m/z 119.
		11	ug/l	ISO	1,2,3,5-tetramethyl benzene
		11	ug/l	ISO	1,2,3,4-tetramethylbenzene.
		3.6	ug/l	Unk	Unknown m/z 119.
		12.9	ug/l	Unk	2 Unknowns
		5.6	ug/l		1,4-dihydro-1,4-methanonaphthalene.
		7.9	ug/l	SUS	phthalate ester.

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TOT = TOTAL CONCENTRATION REPORTED: Represents the sum of several compounds detected all belonging to the same chemical class.

ISO = OR ISOMER: Compound identification is not selective for this isomer only. This result may instead represent the presence of a similar compound comprised of the same atoms bonded together in a different arrangement or substitution pattern.

SAMPLE DATA SUMMARY: ORGANIC TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NUMBER	ANALYSIS FRACTION (VOA/BNA)	ESTIMATED CONCENTRATION VALUE	ESTIMATED CONCENTRATION UNITS	QUALIFIER CODE	NUS Labs COMPOUND NAME PAGE 1 of 3
CC386	VOA				ND
↓	BNA				ND
CC387	VOA	50	ug/kg	Unk	Unknown alcohol.
		40		ISO	methylene-cyclohexane.
		60		ISO	(2-methylpropyl)-cyclohexane
		90			1,2-diethyl-1-methyl-cyclohexane
	↓	30	↓		propyl-benzene
↓	BNA	20,000	↓		Sulfur (S8)
CC388	VOA	800	ug/kg	ISO	1,1,3-trimethyl-cyclohexane.
		700	ug/kg	ISO	trans-octahydro-1H-indene
		300		ISO	1-ethyl-1-methyl-cyclohexane
		2000		Unk	Unknown - contains bromine
		300		ISO	octyl-cyclopropane.
		1000		ISO	(1-methylethyl)-cyclohexane.
		562		Unk	Unknown.
		1000		ISO	trans-1,4-dimethyl-cyclooctane.
		1000		ISO	propylbenzene.
	↓	500		ISO	1-methyl-4-propyl-benzene.
	BNA	60,000		ISO	1,3,5-trimethylbenzene.
		100,000		ISO	2,6-dimethylnonane.
		60,000			butylcyclohexane.
		50,000		ISO	3,7-dimethylnonane
		100,000			trans-decahydro-naphthalene.
		100,000			1-ethyl-2-methyl-cyclohexane
		40,000		ISO	1,2,4,5-tetramethylbenzene.
		50,000		ISO	pentyl-cyclohexane.
↓	↓	40,000	↓		decahydro-2-methyl-naphthalene

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SAMPLE DATA SUMMARY: ORGANIC TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NUMBER	ANALYSIS FRACTION (VOA/BNA)	ESTIMATED CONCENTRATION VALUE	ESTIMATED CONCENTRATION UNITS	QUALIFIER CODE	NUSCAbs COMPOUND NAME PAGE 2 of 3
CC388	BNA	30,000	ug/kg	ISO	decahydro-2-methyl-naphthalene
(cont)	↓	600,000	ug/kg		Sulfur (S8)
↓	↓	470,000	↓	TOT	Total aliphatic hydrocarbon matrix
CC389	VOA	40	ug/kg	Unk	Unknown m/z: 73
↓	BNA	10,000	↓	ISO	perylene
CC391	VOA	50	ug/kg	ISO	tricyclo [3.3.1.13,7] decane.
↓	↓	90	↓	ISO	bicyclo [3.3.1] nonane
↓	↓	300	↓	Unk	Unknown m/z: 95
↓	↓	70	↓	Unk	Unknown m/z 135
↓	↓	700	↓		1-butyl-2-propyl-cyclopentane
↓	↓	200	↓	Unk	Unknown m/z 97
↓	↓	80	↓	Unk	Unknown m/z 123
↓	↓	1000	↓	ISO	trans-decahydro-naphthalene.
↓	↓	100	↓		1-ethyl-1,3-dimethyl-cyclohexane.
↓	BNA	10,000	↓		3,3-dimethyl-cyclohexane.
↓	↓	10,000	↓	Unk	Unknown m/z 57.
↓	↓	10,000	↓	ISO	trans-decahydro-naphthalene.
↓	↓	90,000	↓	ISO	1-ethyl-2-methyl-cyclohexane.
↓	↓	20,000	↓		Sulfur (S8)
↓	↓	20,000	↓	ISO	perylene
↓	↓	140,000	↓	TOT	Total aliphatic hydrocarbon matrix
CC392	VOA	80	ug/kg	ISO	cis-octahydro-1H-indene
↓	↓	40	↓		1-ethyl-2-methyl-cyclohexane
↓	↓	50	↓		(1-methylethyl)-cyclohexane
↓	↓	200	↓		propyl-cyclohexane.
↓	↓	50	↓	Unk	Unknown m/z 67

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SAMPLE DATA SUMMARY: ORGANIC TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NUMBER	ANALYSIS FRACTION (VOA/BNA)	ESTIMATED CONCENTRATION VALUE	ESTIMATED CONCENTRATION UNITS	QUALIFIER CODE	NUS Labs COMPOUND NAME PAGE 3 of 3
CC392	VOA	500	ug/kg	ISO	1,4-dimethyl-Cyclooctane (trans)
(cont)	↓	40	↓	UNK	Unknown m/z 95
↓	BNA	5,000	↓	TOT	Total aliphatic hydrocarbons
CC393	VOA	10	ug/kg	UNK	Unknown m/z 73
↓	BNA	1000	ug/kg	UNK	Unknown hydrocarbon.

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SAMPLE DATA SUMMARY: ORGANIC TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NUMBER	ANALYSIS FRACTION (VOA/BNA)	ESTIMATED CONCENTRATION VALUE	ESTIMATED CONCENTRATION UNITS	QUALIFIER CODE	GSRI-High COMPOUND NAME PAGE 1 of 1
C5758-11	VOA	160,000	ug/kg	ISO	1,1,2-trimethylcyclohexane.
		85,000		ISO	CIS-Octahydro 1-H-indene.
		93,000		ISO	1-ethyl-1-methyl-cyclohexane.
		270,000		ISO	propyl-cyclohexane.
		730,000		ISO	trans-1,4-dimethylcyclohexane.
		320,000		ISO	propyl-benzene.
	↓	490,000		TOT	2-Unknown hydrocarbons.
	BNA	230,000		ISO	Xylenes - verifies VOA.
		140,000		ISO	propylcyclohexane.
		320,000		ISO	1-methyl-2-propylcyclohexane.
		450,000		ISO	1,2,4-trimethylbenzene
		350,000		ISO	butylcyclohexane.
		180,000		ISO	1-methyl-3-propylbenzene
↓	↓	4,021,000	↓	TOT	Total aliphatic hydrocarbons
C5758-12	VOA	3300	ug/kg	Unk	Unknown hydrocarbon.
	BNA	15,000		ISO	1,3,5-trimethylbenzene.
		8,800		Unk	Unknown cyclohexane. (alkyl)
		13,000		ISO	1-methyl-3-(1-methylethyl)-benzene.
↓	↓	113,200	↓	Tot	Total aliphatic hydrocarbon
C5626-12	VOA				ND
	BNA	67,000	ug/kg		Total Xylenes - confirms VOA.

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3.2.2 Inorganic Data: Lab Case 4692

3.2.2.1 Introduction

The inorganic analyses for this case were performed by 1 CLP laboratory which analyzed 37 solid and 12 aqueous samples.The findings offered in this report are based on a general review of all available inorganic laboratory data, blank analysis results, matrix spike, laboratory and field duplicate results, calibration data, quantitation of results, and ICP interference results. In addition the results from the 2 high hazard samples are not addressed in their report.

3.2.2.2 Qualifiers

It is recommended that this data package be utilized only with the following qualifier statements:

- The presence of the following constituents are qualitively questionable:

Constituents	Samples with Questionable Results
aluminum	MCD154, MCD155, MCD156, and MCD157
chromium	All positive sample results except MCD133, MCD138, MCD142, MCD143, MCD145 MCD146, MCD147, MCD151 MCD097, MCD098, and MCD099
iron	MCD155, MCD156, and MCD157
nickel	All positive sample results except MCD151, MCD097, MCD098, and MCD099

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Constituents	Samples with Questionable Results
potassium	MCD089, MCD090, MCD145, MCD152, and MCD153
silver	MCD140, MCD086, and MCD087
sodium	All positive results except MCD096 and MCD154
tin	MCD143, MCD084, MCD085, MCD145, MCD149, MCD151, MCD152, and MCD153
zinc	MCD134, MCD138, MCD139, MCD154, MCD155, MCD156, and MCD157

The aforementioned constituents cannot be assumed present, based upon this analysis, as data contain direct evidence to doubt their presence. (They may or may not be present.) Generally, these data are best used to demonstrate that substantially greater levels of environmental contamination do not exist in the above sample results.

- The qualitative or quantitative validity of sample results for potassium, arsenic, lead, selenium, thallium, or tin cannot be verified to the extent that would be possible if actual raw data (instrument printouts) were provided.

- The reported concentration of thallium in sample MCD081 and tin in sample MCD147 should be considered estimated.

- The reported concentration of lead in sample MCD144 should be considered estimated.

- The reported concentrations of arsenic and potassium in samples MCD097 and MCD099 and mercury in sample MCD099 should be considered estimated.

- The reported concentrations of zinc and lead in samples MCD145 and MCD137, chromium and cyanide in sample MCD145, and arsenic in sample MCD137 should be considered estimates.

- The reported concentrations of lead in sample MCD157 should be considered estimated.

- The presence of selenium in sample MCD081 has been labeled presumptive because data suggest the possibility that this result might have been interchanged with that of a laboratory Q.C. sample. However, if selenium is actually present in this sample, the actual concentration could be substantially higher.

- The actual detection limit for antimony in samples MCD081 and MCD147 may be slightly higher than reported. This may also be true of other solid samples similar in physical and chemical characteristics.

- The actual detection limits for selenium and tin in samples MCD097 and MCD099 may be substantially higher than reported. In addition, the actual detection limit for silver in these samples may be slightly higher than reported. These effects may also be true for other aqueous samples similar in physical and chemical characteristics.

3.2.2.3 Findings

- Field and/or laboratory blank analysis revealed the presence of aluminum, chromium, iron, nickel, potassium, silver, sodium, tin, and zinc at sufficient concentrations to question the aforementioned sample results for these constituents.

- For the analysis of arsenic, lead, selenium, thallium, tin, and potassium the laboratory has submitted "raw data" in the form of handwritten tabulated final concentrations. During a recent inquiry of another CLP case, this laboratory has produced instrument printouts. This laboratory should be required to submit these furnace AA printouts for proper validation of data for all cases.

- High recoveries were reported for the matrix spike constituents thallium in sample MCD081 and tin in sample MCD147. Since laboratory duplicate analyses of these samples were not performed, a direction of bias cannot be ascertained (a precision problem cannot differentiated from an accuracy problem).

- The method of standard additions for the quantitation of lead in samples MCD144 resulted in a coelative coefficient below acceptable criteria.

- The analyses of field duplicates MCD097 and MCD099 revealed poor precision for arsenic, potassium, and mercury.

- Analyses of field duplicates MCD145 and MCD137 revealed poor precision for zinc, lead, arsenic, chromium, and cyanide.

- Analyses of field duplicates MCD155 and MCD157 revealed poor precision for lead.

- Raw data indicated a non-detected result for the selenium matrix spike of sample MCD081. It is unusual that selenium was reported in the unspiked aliquot at a concentration expected for a matrix spike addition. Consequently, the possibility that these aliquots were switched cannot be discounted. If these aliquots were correctly analyzed, then the actual concentration of selenium in sample MCD081 may be substantially higher.

- Low recoveries were reported for the matrix spike constituent antimony in samples MCD081 and MCD147.

- Zero recoveries were reported for the matrix spike constituents selenium and tin in samples MCD099. Low recovery was reported for the matrix spike constituent silver in this sample. In particular, these effects have been directly applied to the field duplicate of this sample (MCD097).

3.2.2.4 Summary

The attached Quality Assurance Review has identified the aforementioned areas of concern. The text of this report has been formatted to address only those problems areas which affect the application of the data to the subject investigation. Documentation of these problems and also documentation of any observed areas of contractual noncompliance are included in the attached Support Documentation appendix to this report.

Report prepared by Rock J. Vitale (215) 687-9510 Rock J. Vitale Date: September 11, 1986

TDD Number TB-8508-37
EPA Number PA 681

SAMPLE ANALYSIS SUMMARY
TARGET COMPOUNDS

☒ Organic ☐ Inorganic

Site Name OSBORNE Disposal
Date of Sample 9/24/85 9/26/85

Solid sample results reported as dry weight. except Hi Haz Samples

Sample Number	Sample Description and Location	Phase	Units	Compounds Detected: Chloroethane	Methylene Chloride	Acetone	Carbon Disulfide	Trans-1,2-Dichloroethene	2-Butanone	Carbon Tetrachloride	Trichloroethene	Benzene	Toluene	Ethylbenzene	Total Xylenes	Phenol	Remarks
CS758-12	Drum #1 (Sam)	Sol	ug/kg		UF 6900 ◇	UF 29000 ◇							UF 2800 ◇		F 14000		High Hazard Spl
CS606-12	Drum #2	Sol	ug/kg		UF 3600 ◇	UF 29000 ◇							UF 3500 ◇	F 15000	F 160000		High Hazard Spl
CC 373	TP-3	Sol	ug/kg		UF 3700 ◇	UF 6800 ◇			UF 9600 ◇	N 270 J						99 J	Medium Protocol for VOAs
CC 374	TP-10	Sol	ug/kg		UF 3200 ◇	UF 7100 ◇			UF 8600 ◇	N 270 J			130 J	250 J	28000		Medium Protocol for VOAs
CC 375	TP-7	Sol	ug/kg		UF 2800 ◇	UF 3100 ◇	64 J		UF 10000 ◇	N 270 J	94 J	150 ◇	390 J	800	24000		Medium Protocol for VOAs
CC 376	TP-5	Sol	ug/kg		UF 2500 ◇	UF 7600 ◇			UF 14000 ◇	N 220 J				140 J	1500		Medium Protocol for VOAs
CC 377	TP-4A	Sol	ug/kg		UF 3300 ◇	UF 9600 ◇											Medium Protocol for VOAs
CC 378	DUP of CC 386 TP-4B	Sol	ug/kg		UF 3000 ◇	UF 3200 ◇			UF 7200 ◇	N F 310 J			F 180 J				Medium Protocol for VOAs
CC 379	L-1	Sol	ug/kg		UF 5300 ◇	UF 12000 ◇			UF 16000 ◇	N 340 J			140 J			110 J	Medium Protocol for VOAs
CC 380	L-3	Sol	ug/kg		UF 3100 ◇	UF 5900 ◇			UF 9300 ◇	N 300 J			170 J				Medium Protocol for VOAs
CC 381	TP-3	Sol	ug/kg		UF 34 ◇	UF 140 ◇			UF 480 ◇								
CC 382	TP-12	Sol	ug/kg		UF 3200 ◇	UF 5000 ◇			UF 10000 ◇	N 210 J	110 J		240 J				Medium Protocol for VOAs
CC 383	P-1	Sol	ug/kg		UF 8500 ◇	UF 9400 ◇			UF 11000 ◇								Medium Protocol for VOAs
CC 384	TP-13	Sol	ug/kg		UF 59000 ◇	UF 140000 ◇								27000	600000		Medium Protocol for VOAs

NOTE: For a review of this data and non-target, tentatively identified compounds, please see the Analytical Quality Assurance section of this report.

◇ Denotes results of questionable qualitative significance based upon quality assurance review of data.

Quality Assurance performed by Rock J. Vitale (215) 687-9510.

TDD Num: F3-8505-37
EPA Number: DA 681

TARGET COMPOUNDS
☒ Organic ☐ Inorganic

Site Name: OSBORNE DISPOSAL
Date of Sample: 9/24/85 - 9/26/85

Solid sample results reported as dry weight.

Sample Number	Sample Description and Location	Phase	Units	Compounds Detected: Chloroethane	Methylene Chloride	Acetone	Carbon Disulfide	Trans-1,2-Dichloroethene	2-Butanone	Carbon Tetrachloride	Trichloroethene	Benzene	Toluene	Ethylbenzene	Total Xylenes	Phenol	Remarks
CC365	TP-14	SOL	ug/kg		UF 13 ◇	UF 59 ◇			UF 280 ◇								
CC366	DUP of CC378 TP-18D	SOL	ug/kg		UF 7.2 ◇	UF 15 ◇											
CC367	S-3 (1"-6")	SOL	ug/kg		UF 43 ◇	UF 310 ◇			UF 230 ◇								Medium Protocol for BNA & Pest.
CC368	S-3 (6"-12")	SOL	ug/kg		UF 90 ◇	UF 490 ◇			UF 990 ◇					550 F	630 F		Medium Protocol for BNA & Pest
CC369	SOL BLANK	SOL	ug/kg		14				6								Only VOAs Analyzed
CC370	TP-15	SOL	ug/kg		UF 10 ◇	UF 14 ◇					F 5.7		F 17				Medium Protocol for BNA & Pest
CC371	TP-17	SOL	ug/kg		UF 12 ◇	UF 32 ◇		F 26			F 43		J F 11.8				Medium Protocol for BNA & Pest
CC372	TP-18	SOL	ug/kg		UF 30 ◇	UF 31 ◇			UF 68 ◇								
CC373	TP-19	SOL	ug/kg		UF 23 ◇	UF 52 ◇							J 1.4 ◇				
CC372	LW-1	AQ	ug/L	9.6											75		
CC365	DUP of CC368 LW-2	AQ	ug/L														
CC366	LW-3	AQ	ug/L			UF 30 ◇		5.2			12.4			6.7	F 1270		VOAs analyzed only
CC367	LW-4	AQ	ug/L		UF 87 ◇												
CC368	DUP of CC365 LW-2A	AQ	ug/L														

NOTE: For a review of this data and non-target, tentatively identified compounds, please see the Analytical Quality Assurance section of this report.

◇ Denotes results of questionable qualitative significance based upon quality assurance review of data

Quality Assurance performed by Rock
J. Vitale (215) 687-9510.

TDD Number F3-8506-37
EPA Number PA 681

SAMPLE SUMMARY
TARGET COMPOUNDS

☒ Organic ☐ Inorganic

Site Name OSBORNE DISPOSAL
Date of Sample 9/24/85 9/26/85

Solid sample results reported as dry weight. Except High Hazard Samples

Compounds Detected

Sample Number	Sample Description and Location	Phase	Units	Chloroethane	Methylene Chloride	Acetone	Carbon Disulfide	Trans-1,2-Dichloroethene	2-Butanone	Carbon Tetrachloride	Trichloroethene	Benzene	Toluene	Ethylbenzene	Total Xylenes	Phenol	Remarks
cc 359	AQ BLANK	AQ	ug/L														
cc 370	BOILER BLANK	AQ	ug/L		10												
cc 348	S-1	SOL	ug/kg		UF 38 ◇	UF 110 ◇			UF 17 ◇								
cc 349	S-9A	SOL	ug/kg		UF 31 ◇	UF 45 ◇										150	
cc 350	S-9	SOL	ug/kg		UF 32 ◇	UF 54 ◇			UF 7 ◇								
cc 351	S-9B	SOL	ug/kg		UF 18 ◇	UF 23 ◇			UF 34 ◇								
cc 352	S-6	SOL	ug/kg		UF 78 ◇	UF 130 ◇			UF 30 ◇								
cc 353	S-5	SOL	ug/kg		UF 29 ◇	UF 31 ◇			UF 64 ◇								
cc 354	S-7A	SOL	ug/kg		UF 9 ◇	UF 17 ◇			UF 17 ◇								
cc 355	S-7	SOL	ug/kg		UF 10 ◇	UF 36 ◇			UF 34 ◇								
cc 356	S-4A	SOL	ug/kg		UF 11 ◇	UF 41 ◇			UF 56 ◇								
cc 357	S-4	SOL	ug/kg		UF 8 ◇	UF 37 ◇	1.0		UF 69 ◇								
cc 358	S-2	SOL	ug/kg		UF 7 ◇	UF 50 ◇			UF 160 ◇								
cc 360	S-8 (1"-6")	SOL	ug/kg		UF 11 ◇	UF 8 ◇											

NOTE: For a review of this data and non-target, tentatively identified compounds, please see the Analytical Quality Assurance section of this report.

◇ Denotes results of questionable analytical significance based upon quality assurance review of data.

Quality Assurance performed by Rock J. Vitale (215) 687-9510.

300392

TDD Number F3-8508-37
EPA Number TA 681

SAMPLE DATA SUMMARY
TARGET COMPOUNDS
☒ Organic ☐ Inorganic

Site Name CSPROVE DISPOSAL
Date of Sample 9/24/85 - 9/26/85

Solid sample results reported as dry weight. Except High Hazard Samples

Sample Number	Sample Description and Location	Phase	Units	Chloromethane	Methylene Chloride	Acetone	Carbon Disulfide	Trans 1,2-Dichloroethene	2-Butanone	Carbon Tetrachloride	Trichloroethene	Benzene	Toluene	Ethylbenzene	Total Xylenes	Phenol	Remarks
CC361	S-8(6"-12")	SOL	ug/kg		UF 8 ◇				UF 180 ◇				9.0				
CC362	S-8A (1"-6")	SOL	ug/kg		UF 11 ◇	UF 22 ◇			UF 53 ◇								
CC363	S-8A (6"-12")	SOL	ug/kg		UF 14 ◇	UF 29 ◇			UF 79 ◇								
CC371	SOIL BLANK	SOL	ug/kg		3.0				UF 17								VOA's analyzed only
CSX58-11	DRUM #1 (SPLIT)	SOL	ug/kg		UF 93000 ◇	UF 140000 ◇							UF 58,000 ◇	E 94000	E 1.4x10^6		High Hazard Sample.

NOTE: For a review of this data and non-target, tentatively identified compounds, please see the Analytical Quality Assurance section of this report.

◇ Denotes results of questionable qualitative significance based upon quality assurance review of data.

Quality Assurance performed by Rock J. Vitale (215) 687-9510.

300393

TDD Number: F3-8508-37
EPA Number: PA 681

SAMPLE SUMMARY
TARGET COMPOUNDS

☒ Organic ☐ Inorganic

Site Name: OSBORNE DISPOSAL
Date of Sample: 9/24/85 - 9/26/85

Solid sample results reported as dry weight. Except High Hazard Samples

Sample Number	Sample Description and Location	Phase	Units	Compounds Detected: 2-Methylphenol	4-Methylphenol	2,4-Dimethylphenol	Benzoic Acid	Naphthalene	2-Methylnaphthalene	Heterophthene	Dibenzofuran	Fluorene	Phenanthrene	Anthracene	Di-N-Butylphthalate	Fluoranthene	Remarks
cc 369	AQ BLANK	AQ	ug/L														
cc 370	BAILER BLANK	AQ	ug/L														
cc 348	S-1	SOL	ug/kg														
cc 349	S-9A	SOL	ug/kg	120 J	270 J	77 J	610 J	279 J	650		240 J		1200	120 J		570	
cc 350	S-9	SOL	ug/kg											UE 56 ◇		22 J	
cc 351	S-9B	SOL	ug/kg											UE 37 ◇			
cc 352	S-6	SOL	ug/kg					130 J	130 J		35 J		390 J	49 J	UE 120 ◇	1100	
cc 353	S-5	SOL	ug/kg					200 J	130 J		63 J		950	190 J	UE 57 ◇	2500	
cc 354	S-7A	SOL	ug/kg														
cc 355	S-7	SOL	ug/kg												UE 91 ◇		
cc 356	S-4A	SOL	ug/kg										43 J		UE 29 ◇		
cc 357	S-4	SOL	ug/kg	55 J			50 J	44 J	120 J			140 J					
cc 358	S-2	SOL	ug/kg												UE 42 ◇		
cc 360	S-8 (1"-6")	SOL	ug/kg												UE 52 ◇		

NOTE: For a review of this data and non-target, tentatively identified compounds, please see the Analytical Quality Assurance section of this report.

◇ Denotes results of questionable qualitative significance based upon quality assurance review of data.

Quality Assurance performed by Rock J. Vitale (215) 687-9510.

3003634

T F3-...-57
EPA Number PA GFI

TARGET COMPOUNDS
☒ Organic ☐ Inorganic

Site Name COSMURNE DISPOSAL
Date of Sample 9/24/85 - 9/26/85

Solid sample results reported as dry weight.

Compounds Detected

Sample Number	Sample Description and Location	Phase	Units	2-Methylphenol	4-Methylphenol	2,4-Dimethylphenol	Benzoic Acid	Naphthalene	2-Methylnaphthalene	Acenaphthene	Dibenzofuran	Fluorene	Phenanthrene	Anthracene	D.N.Butylphthalate	Fluoranthene	Remarks
CC385	TP-14	SOL	ug/kg					37 J	40 J				74 J			110 J	
CC386	DUP of CC378 TP-4BD	SOL	ug/kg												UF 1300		
CC387	S-3 (1"-6")	SOL	ug/kg													J 6000	Medium Protocol for BNA & Pest
CC388	S-3 (6"-12")	SOL	ug/kg					J 17000									medium Protocol for BNA & Pest
CC389	SOL BLANK	SOL	ug/kg														only VOA's analyzed
CC390	TP-15	SOL	ug/kg													J 4100	Medium Protocol for BNA & pest
CC391	TP-17	SOL	ug/kg													J 6000	medium Protocol for BNA & Pest
CC392	TP-18	SOL	ug/kg												UF 560		
CC393	TP-19	SOL	ug/kg				J 130								UF 200		
CC372	LW-1	AQ	ug/L					11									
CC365	DUP of CC368 LW-2	AQ	ug/L														
CC366	LW-3	AQ	ug/L														VOA's analyzed only
CC367	LW-4	AQ	ug/L														
CC368	DUP of CC365 LW-2A	AQ	ug/L														

NOTE: For a review of this data and non-target, tentatively identified compounds, please see the Analytical Quality Assurance section of this report.

◇ Denotes results of questionable qualitative significance based upon quality assurance review of data

Quality Assurance performed by Rock J. Vitale (215) 687-9510.

300535

TDD Number F3-8508-37
EPA Number PA 081

SAMPLE SUMMARY
TARGET COMPOUNDS

☒ Organic ☐ Inorganic

Site Name OSBORNE DISPOSAL
Date of Sample 9/24/85 - 9/26/85

Solid sample results reported as dry weight. except Hallaz samples

Sample Number	Sample Description & Location	Phase	Units	2-Methylphenol	4-Methylphenol	2,4-Dimethylphenol	Benzoic Acid	Naphthalene	2-Methylnaphthalene	Acenaphthene	Dibenzofuran	Fluorene	Phenanthrene	Anthracene	Di-N-Butylphthalate	Fluoranthene	Remarks
CS758-11	Drum #1 (Spun)	Sol															High Hazard Sample
CS682-11	Drum #2	AQ															High Hazard Sample
cc 375	P-3	Sol	ug/kg										18 J				
cc 374	TP-10	Sol	ug/kg			1300	30 J										
cc 375	TP-7	Sol	ug/kg				470 J	160 J	150 J		78 J	2300	270 J	UF 330 ◇	12000		
cc 376	TP-5	Sol	ug/kg											UF 28 ◇			
cc 377	TP-4A	Sol	ug/kg				36 J	24 J						UF 30 ◇			
cc 378	Dup of CC 376 TP-4B	Sol	ug/kg											UF 35 ◇			
cc 379	L-1	Sol	ug/kg											UF 68 ◇			
cc 380	L-3	Sol	ug/kg														
cc 381	TP-3	Sol	ug/kg											UF 26 ◇			
cc 382	TP-12	Sol	ug/kg				480 J	260 J	290 J	160 J		2500	460 J	UF 230 ◇	7800		
cc 383	P-1	Sol	ug/kg				1500	1500				2500	270 J		13000		
cc 384	TP-13	Sol	ug/kg				2600 J	2700 J	1600 J	1100	1900	15000	3000 J	UF 2900 ◇	29000		

Compounds Detected

NOTE: For a review of this data and non-target, tentatively identified compounds, please see the Analytical Quality Assurance section of this report.

◇ Denotes results of questionable positive significance based upon review of data

Quality Assurance performed by Rock J. Vitale (215) 687-9510.

TDD Number F3-8508-37
EPA Number PA 681

SAMPLE DETAILS SUMMARY
TARGET COMPOUNDS

☒ Organic ☐ Inorganic

Site Name OSBORNE DISPOSAL
Date of Sample 9/24/85 - 9/26/85

Solid sample results reported as dry weight. Except High Hazard Sample

Sample Number	Sample Description and Location	Phase	Units	2-Methylphenol	4-Methylphenol	2,4-Dimethylphenol	Benzoic Acid	Naphthalene	2-Methylnaphthalene	Acenaphthene	Dibenzofuran	Fluorene	Phenanthrene	Anthracene	D-N-Butylphthalate	Fluoranthene	Remarks
cc361	S-8(6"-12")	Sol	ug/kg											UJ 43◇			
cc362	S-8A (1"-6")	Sol	ug/kg											UJ 46◇			
cc363	S-8A (6"-12")	Sol	ug/kg											UJ 43◇			
cc371	Sol Blank	Sol	ug/kg														VOAs analyzed only
cc378-11	Drum #1 (Smit)	Sol	ug/kg														High Hazard Sample.

NOTE: For a review of this data and non-target, tentatively identified compounds, please see the Analytical Quality Assurance section of this report.

◇ Denotes results of questionable qualitative significance based upon quality assurance review of data.

Quality Assurance performed by Rock J. Vitale (215) 687-9510.

00397

TDD Number F3-8508-37
EPA Number PA 681

SAMPLE SUMMARY
TARGET COMPOUNDS

☒ Organic ☐ Inorganic

Site Name OSBORNE DISPOSAL
Date of Sample 9/24/85 - 9/26/85

Solid sample results reported as dry weight. Except High Hazard Samples

Sample Number	Sample Description and Location	Phase	Units	Compounds Detected: Pyrene	Benzo(a)Anthracene	Bis(2-Ethylhexyl)Phthalate	Chrysene	Benzo(b)Fluoranthene	Benzo(k)Fluoranthene	Benzo(a)Pyrene	Indeno(1,2,3-cd)Pyrene	Dibenz(a,h)Anthracene	Benzo(g,h,i)Perylene	Gamma-BHC (Lindane)	Dieldrin	4,4'-DDE	Remarks
cc 369	AQ BLANK	AQ	ug/L														
cc 370	BAILER BLANK	AQ	ug/L														
cc 348	S-1	SOL	ug/kg														
cc 349	S-9A	SOL	ug/kg	360 J	370 J		430 J	140 J II	110 J II	110 J				57 ◇			
cc 350	S-9	SOL	ug/kg	17 J													
cc 351	S-9B	SOL	ug/kg														
cc 352	S-6	SOL	ug/kg	900	1200	UF 140 ◇	2000	2300 II	2500 II	1900	2800	1100	3300				
cc 353	S-5	SOL	ug/kg	2100	2800	UF 240 ◇	3700	5900 II	4800 II	4000	5200	2200	6000				
cc 354	S-7A	SOL	ug/kg														
cc 355	S-7	SOL	ug/kg														
cc 356	S-4A	SOL	ug/kg			UF 39 ◇											
cc 357	S-4	SOL	ug/kg			UF 190 ◇											
cc 358	S-2	SOL	ug/kg			UF 80 ◇											
cc 360	S-8 (1"-6")	SOL	ug/kg														

NOTE: For a review of this data and non-target, tentatively identified compounds, please see the Analytical Quality Assurance section of this report.

◇ Denotes results of questionable qualitative significance based upon quality assurance review of data

Quality Assurance performed by Rock J. Vitale (215) 687-9510.

II - Indistinguishable Isomers

Task No. F3-1517 - 37
EPA Number: PA 681

TARGET COMPOUNDS
☒ Organic ☐ Inorganic

Site Name OSBORNE DISPOSAL
Date of Sample 9/24/85 - 9/26/85

Solid sample results reported as dry weight.

Sample Number	Sample Description & Location	Phase	Units	Compounds Detected: Pyrene	Benzo(a)Anthracene	Bis(2-Ethylhexyl)Phthalate	Chrysene	Benzo(b)Fluoranthene	Benzo(k)Fluoranthene	Benzo(a)Pyrene	Indeno(1,2,3-cd)Pyrene	Dibenz(a,h)Anthracene	Benzo(g,h,i)Perylene	Common-BHC (Lindane)	Dieldrin	4,4-DDE	Remarks
CC385	TP-14	SOL	ug/kg	110 J	120 J	UF 280 ◇	190 J	290 J	180 J	190 J	260 J	85 J	360 J				
CC386	DUP of CC378 TP-4BD	SOL	ug/kg														
CC387	S-3 (1"-6")	SOL	ug/kg	J 4200			J 6500	J 20,000		J 9500			J 12000				Medium Protocol for BNA & Pest.
CC388	S-3 (6"-12")	SOL	ug/kg	J 7700													Medium Protocol for BNA & Pest.
CC389	SOL BLANK	SOL	ug/kg														Only VOA's analyzed
CC390	TP-15	SOL	ug/kg	J 3600			J 6700	J 21000		J 8400			J 11000				Medium Protocol for BNA & Pest.
CC391	TP-17	SOL	ug/kg	J 6400			J 13000		J 35000				J 17000				Medium Protocol for BNA & Pest.
CC392	TP-18	SOL	ug/kg														
CC393	TP-19	SOL	ug/kg														
CC372	LW-1	AQ	ug/L			UF 34 ◇											
CC365	DUP of CC366 LW-2	AQ	ug/L			UF 39 ◇											
CC366	LW-3	AQ	ug/L														VOAs analyzed only
CC367	LW-4	AQ	ug/L			UF 7 ◇											
CC368	DUP of CC365 LW-2A	AQ	ug/L			UF 18 ◇											

NOTE: For a review of this data and non-target, tentatively identified compounds, please see the Analytical Quality Assurance section of this report.

◇ Denotes results of questionable positive significance based upon quality assurance review of data

— Quality Assurance performed by Rock —
— J. Vitale (215) 687-9510. —
— —

TDD Number F8-8506-37

EPA Number PA 681

SAMPLE TYPE / TARGET COMPOUNDS

☒ Organic ☐ Inorganic

Site Name OSBORNE Disposal

Date of Sample 9/21/85 - 9/22/85

Solid sample results reported as dry weight. except Hi Haz Samples

Compounds Detected

Sample Number	Sample Description & Location	Phase	Units	Pyrene	Benzo(a)Anthracene	Bis(2-Ethylhexyl)Phthalate	Chrysene	Benzo(b)Fluoranthene	Benzo(k)Fluoranthene	Benzo(a)Pyrene	Indeno(1,2,3-cd)Pyrene	Dibenz(a,h)Anthracene	Benzo(g,h,i)Perylene	Gamma-BHC (Lindane)	Dieldrin	4,4-DDE	Remarks
CC378-12	Drum # 1 (Rinse)	SOL															High Hazard Sample
CC382-12	Drum # 2	AQ															High Hazard Sample.
CC 373	D-3	SOL	ug/kg	150 J		130 UF											
CC 374	TP-10	SOL	ug/kg			150 UF											
CC 375	TP-7	SOL	ug/kg	17,000	25000		22000	37000	20000	28000	21000	8800	17000				
CC 376	TP-5	SOL	ug/kg														
CC 377	TP-4A	SOL	ug/kg			160 UF											
CC 378	DUP OF CC 386 TP-4B	SOL	ug/kg			190 UF											
CC 379	L-1	SOL	ug/kg			520 UF											
CC 380	L-3	SOL	ug/kg			180 UF											
CC 381	TP-3	SOL	ug/kg			220 UF											
CC 382	TP-12	SOL	ug/kg	3000 F	6200	270 UF	8700	9600	7900	9400	8000	3500	8900				
CC 383	P-1	SOL	ug/kg	8900	14000	2100 UF	15000	15000	16000	15000	8300	3700	8600				
CC 384	TP-13	SOL	ug/kg	12000 F	20000	930 UF	32000	36000 II	37000 II	31000	25000	9900	29000		60 FN J	60 FN J	

NOTE: For a review of this data and non-target, tentatively identified compounds, please see the Analytical Quality Assurance section of this report.

◇ Possible results of questionable analytical significance based upon quality assurance review of data.

Quality Assurance performed by Rock J. Vitale (215) 687-9510.

II - Indistinguishable Isomers

300 CC

TDD Number F3-8508-37
EPA Number PA 681

SAMPLE ANALYSIS SUMMARY
TARGET COMPOUNDS

☒ Organic ☐ Inorganic

Site Name OSBORNE DISPOSAL
Date of Sample 9/24/85 - 9/26/85

Solid sample results reported as dry weight. Except High Hazard Sample.

Sample Number	Sample Description and Location	Phase	Units	Compounds Detected: Pyrene	Benzo(a) Anthracene	Bis(2-Ethylhexyl) Phthalate	Chrysene	Benzo(b) Fluoranthene	Benzo(k) Fluoranthene	Benzo(a) Pyrene	Indeno (1,2,3-cd) Pyrene	Dibenz (a,h) Anthracene	Benzo(g,h,i) Perylene	Gamma-BHC (Lindane)	Dieldrin	4,4-DDE	Remarks
cc361	S-8 (6"-12")	SOL	ug/kg			530 UF											
cc362	S-8A (1"-6")	SOL	ug/kg			1500 UF											
cc363	S-8A (6"-12")	SOL	ug/kg			95 UF											
cc371	Soil Blank	SOL	ug/kg														VOA's analyzed only
C5798-11	Drum #1 (Split)	SOL	ug/kg														High Hazard Sample.

NOTE: For a review of this data and non-target, tentatively identified compounds, please see the Analytical Quality Assurance section of this report.

◇ Denotes results of questionable qualitative significance based upon quality assurance review of data.

Quality Assurance performed by Rock J. Vitale (215) 687-9510.

TDD Number: F3-8508-37
EPA Number: PA 681

SAMPLE SUMMARY
TARGET COMPOUNDS
☒ Organic ☐ Inorganic

Site Name: OSBORNE DISPOSAL
Date of Sample: 9/24/85 - 9/26/85

Solid sample results reported as dry weight. Except High Hazard Samples.

Sample Number	Sample Description and Location	Phase	Units	Compounds Detected: Endosulfan II	Aroclor-1254	Aroclor-1260	Remarks
CC369	AQ BLANK	AQ	ug/L				
CC370	BAILER BLANK	AQ	ug/L				
CC348	S-1	SOL	ug/kg				
CC349	S-9A	SOL	ug/kg				
CC350	S-9	SOL	ug/kg				
CC351	S-9B	SOL	ug/kg				
CC352	S-6	SOL	ug/kg		680		
CC353	S-5	SOL	ug/kg		2500		
CC354	S-7A	SOL	ug/kg				
CC355	S-7	SOL	ug/kg				
CC356	S-4A	SOL	ug/kg				
CC357	S-4	SOL	ug/kg				
CC358	S-2	SOL	ug/kg				
CC360	S8 (1"-6")	SOL	ug/kg				

NOTE: For a review of this data and non-target, tentatively identified compounds, please see the Analytical Quality Assurance section of this report.

◇ Denotes results of questionable analytical significance based upon quality assurance review of data.

Quality Assurance performed by Rock J. Vitale (215) 687-9510.

300402

TDD Number F3-8509-37

EPA Number PA 681

SAMPLE SUMMARY
TARGET COMPOUNDS

☒ Organic ☐ Inorganic

Site Name CORRINE DISPOSAL

Date of Sample 9/24/85 - 9/26/85

Solid sample results reported as dry weight.

Sample Number	Sample Description & Location	Phase	Units	Compounds Detected: Endosulfan II	Aroclor-1254	Aroclor-1260											Remarks
cc385	TP-14	SOL	ug/kg														
cc386	DUP of CC378 TP-4BD	SOL	ug/kg														-
cc387	S-3 (1"-6")	SOL	ug/kg		J 1,600												Medium Protocol for BNA & Pest.
cc388	S-3 (6"-12")	SOL	ug/kg		19000												Medium Protocol for BNA & Pest
cc389	SOL BLANK	SOL	ug/kg														Only VOA's analyzed
cc390	TP-15	SOL	ug/kg														Medium Protocol for BNA & Pest
cc391	TP-17	SOL	ug/kg														Medium Protocol for BNA & Pest
cc392	TP-18	SOL	ug/kg		730												
cc393	TP-19	SOL	ug/kg														
cc372	LW-1	AQ	ug/L														
cc365	DUP of CC368 LW-2	AQ	ug/L														
cc366	LW-3	AQ	ug/L														VOA's analyzed Only
cc367	LW-4	AQ	ug/L														
cc368	DUP of CC365 LW-2A	AQ	ug/L														

NOTE: For a review of this data and non-target, tentatively identified compounds, please see the Analytical Quality Assurance section of this report.

◇ Denotes results of questionable analytical significance based upon quality assurance review of data

— Quality Assurance performed by Rock —
— J. Vitale (215) 687-9510. —
— —

300403

TDD Number TB-8508-37
EPA Number PA 681

SAMPLE SUMMARY
TARGET COMPOUNDS

☒ Organic ☐ Inorganic

Site Name OSBORNE DISPOSAL
Date of Sample 9/24/85 - 9/26/85

Solid sample results reported as dry weight. except High Hazard Samples

Sample Number	Sample Description and Location	Phase	Units	Compounds Detected: Endosulfan II	Aroclor-1254	Aroclor-1260											Remarks
CS568-11	Drum #1 (split)	SOL															High Hazard Sample
CS568-12	Drum #2	AQ															High Hazard sample
CC 373	P-3	SOL	ug/kg														
CC 374	TP-10	SOL	ug/kg														
CC 375	TP-7	SOL	ug/kg														
CC 376	TP-5	SOL	ug/kg														
CC 377	TP-4A	SOL	ug/kg														
CC 378	DUP of CC 3776 TP-4B	SOL	ug/kg														
CC 379	L-1	SOL	ug/kg														
CC 380	L-3	SOL	ug/kg														
CC 381	TP-3	SOL	ug/kg														
CC 382	TP-12	SOL	ug/kg			900											
CC 383	P-1	SOL	ug/kg	N 88 J ◇													
CC 384	TP-13	SOL	ug/kg														

NOTE: For a review of this data and non-target, tentatively identified compounds, please see the Analytical Quality Assurance section of this report.

◇ Denotes results of questionable qualitative significance based upon quality assurance review of data

300504

Quality Assurance performed by Rock J. Vitale (215) 687-9510.

TDD Number F3-8508-37
EPA Number PA 681

SAMPLE ANALYSIS SUMMARY
TARGET COMPOUNDS

☒ Organic ☐ Inorganic

Site Name OSBORNE DISPOSAL
Date of Sample 9/24/85 - 9/26/85

Solid sample results reported as dry weight. Except High Hazard Samples

Sample Number	Sample Description and Location	Phase	Units	Compounds Detected: Endosulfan II	Aroclor - 1254	Aroclor - 1260											Remarks
cc361	S-8 (6"-12")	SOL	ug/kg														
cc362	S-8A (1"-6")	SOL	ug/kg														
cc363	S-8A (6"-12")	SOL	ug/kg														
cc371	SOL BLANK	SOL	ug/kg														VOAs analyzed only
cc358-11	DRUM #1 (SPUR)	SOL	ug/kg														High Hazard Sample.

NOTE: For a review of this data and non-target, tentatively identified compounds, please see the Analytical Quality Assurance section of this report.

◇ Denotes results of questionable qualitative significance based upon quality assurance review of data.

Quality Assurance performed by Rock J. Vitale (215) 687-9510.

3005005

SAMPLE DATA SUMMARY
TARGET COMPOUNDS

☐ Organic ☒ Inorganic

DD Number F3-8508-37
PA Number PA 681

Site Name OSBORNE DISP( )
Date of Sample 9/24/85 - 9/26/85

Solid sample results reported as dry weight.

Sample Number	Sample Description and Location	Phase	Units	Compounds Detected: Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Remarks
MCD041	S-8A (1"-6")	SOL	mg/kg	12367		21					11◇			16829	31	1240	
MCD045	S-8A (6"-12")	SOL	mg/kg	14338		28					14◇			23538	36	1488	
MCD131	SOL BLANK	SOL	mg/kg	37										54			
MCD154	LW-1 (FIL)	AQ	ug/L	161◇			375			45100				22040		24240	
MCD155	LW-2 (FIL)	AQ	ug/L	256◇						59150	14◇			286◇		15100	
MCD156	LW-4 (FIL)	AQ	ug/L	165◇			193			117500				143◇		25050	
MCD157	LW-2A (FIL)	AQ	ug/L	187◇						59770				438◇	6.2[F]	15260	
MCD158	AQ BLANK (FIL)	AQ	ug/L	233										257		407	
MCD159	BAILER BLANK (FIL)	AQ	ug/L	155										74			

NOTE: For a review of this data and non-target, tentatively identified compounds, please see the Analytical Quality Assurance section of this report.

◇ Denotes results of questionable qualitative significance based upon quality assurance review of data.

— Quality Assurance performed by Rock — — I. Virale (215) 687-9510. —

SAMPLE DATA SUMMARY
TARGET COMPOUNDS

☐ Organic ☒ Inorganic

Site Name OSBORNE DRUM

Date of Sample 9/24/85 - 9/26/85

TDD Number F3-8508-37

EPA Number PA 681

Solid sample results reported as dry weight.

Sample Number	Sample Description and Location	Phase	Units	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Remarks
				Compounds Detected													
																	DATA Not received yet
C	DRUM #1	SOL															Data Not received yet.
C	DRUM #2	AQ															
MCD 132	P-3	SOL	mg/kg	6572		8.5				567	6.1◇		15	29932	12	1286	
MCD 133	TP-10	SOL	mg/kg	7464		.24				1125	55		28	44658	24	2405	
MCD 134	TP-7	SOL	mg/kg	2043						643	12◇		15	11020	41	1067	
MCD 135	TP-5	SOL	mg/kg	7553		15	56			1106	8.0◇			30523	17	2361	
MCD 136	TP-4A	SOL	mg/kg	5641						4059	6.2◇			20988	13	2698	
MCD 137	TP-4B	SOL	mg/kg	5117		6.6F				5939				20608	12F	2159	
MCD 138	L-1	SOL	mg/kg	3695		11					48			13156	11	804	
MCD 139	L-3	SOL	mg/kg	4127						30569	12◇			14634	7.3	992	
MCD 140	TP-3	SOL	mg/kg	57351		14				7262	6.5◇			20819	16	3395	
MCD 141	TP-12	SOL	mg/kg	7334		9.1	57			5976	21◇		36	35736	36	1725	
MCD 142	P-1	SOL	mg/kg	13024		7.1	101			5160	136	64		55736	789	45629	
MCD 143	TP-13	SOL	mg/kg	3184						1644	90		19	43605	78	1119	

NOTE: For a review of this data and non-target, tentatively identified compounds, please see the Analytical Quality Assurance section of this report.

◇ Denotes results of questionable qualitative significance based upon quality assurance review of data.

— Quality Assurance performed by Rock —
— J. Vitale (215) 687-9510.

3000 C1

DD Number F3-8508-37
EPA Number PA C81

SAMPLE DATA SUMMARY
TARGET COMPOUNDS

☐ Organic ☒ Inorganic

Site Name OSBORNE DISPOSAL
Date of Sample 9/24/85 - 9/26/85

Solid sample results reported as dry weight.

Sample Number	Sample Description and Location	Phase	Units	Compounds Detected: Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Remarks
MCD080	BALLER BLANK	AQ	ug/L	107													
MCD080	S-1	SOL	mg/kg	8222		14	61				11◊		15	26671	22	1537	
MCD081	S-9A	SOL	mg/kg	8435		31	73				10◊		13	26162	57	1074	
MCD082	S-9	SOL	mg/kg	14454		14	117			1378	15◊		20	26594	23	1937	
MCD083	S-9B	SOL	mg/kg	15859		33	83			678	16◊		39	22675	30	2061	
MCD084	S-6	SOL	mg/kg	5653		11	77			7809	18◊		70	27666	50	1692	
MCD085	S-5	SOL	mg/kg	7136		13	85			3285	26◊		60	28148	119	2381	
MCD086	S-7A	SOL	mg/kg	17212		47	66				19◊		19	35076	41	2460	
MCD087	S-7	SOL	mg/kg	14330		37	53				15◊		13	23231	48	1941	
MCD088	S-4A	SOL	mg/kg	5566		12				5806	10◊			21142	22	3057	
MCD089	S-4	SOL	mg/kg	7757		11	69			1175	18◊		33	26389	18	2696	
MCD090	S-2	SOL	mg/kg	8767		9.1	80			893	16◊	16	24	41723	15	2599	
MCD092	S-8 (4"-6")	SOL	mg/kg	5802		14				4417	9.8◊			26848	14	2836	
MCD093	S-8 (6"-12")	SOL	mg/kg	5754		16				6075	9.7◊		12	26850	14	3164	

NOTE: For a review of this data and non-target, tentatively identified compounds, please see the Analytical Quality Assurance section of this report.

◊ Denotes results of questionable qualitative significance based upon quality assurance review of data.

Quality Assurance performed by Rock
T. Virale (215) 687-9510.

TDD Number F3-8508-37
EPA Number PA 681

SAMPLE DATA SUMMARY
TARGET COMPOUNDS

☐ Organic ☒ Inorganic

Site Name OSBORNE DRUM
Date of Sample 9/24/85 - 9/26/85

Solid sample results reported as dry weight.

Sample Number	Sample Description and Location	Phase	Units	Compounds Detected: Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Remarks
MCD144	TP-14	SOL	mg/kg	7435		15	47			2251	95◇	14		28856	20F	2484	
MCD145	TP-4BD	SOL	mg/kg	7219						5663	28F			27331	24F	3010	
MCD146	S-3 (1"-6")	SOL	mg/kg	9761			214			2356	240		247	61155	587	1684	
MCD147	S-3 (6"-12")	SOL	mg/kg	13172		13	294			6640	440		373	123835	918	2810	
MCD148	SOL BLANK	SOL	mg/kg	56					3					74			
MCD149	TP-15	SOL	mg/kg	1925						823	11◇			10461	77	630	
MCD151	TP-17	SOL	mg/kg	7977		7.7	535			14229	56	22	701	60854	639	3164	
MCD152	TP-18	SOL	mg/kg	6844		7.3				4676	11◇	12		36990	14	2755	
MCD153	TP-19	SOL	mg/kg	15920			114	45		1825	29◇	25	23	60778	27	4620	
MCD096	LW-1	AQ	ug/L	1109			430			46170			35	35410	38	24890	
MCD097	LW-2	AQ	ug/L	144900		190F	953	11		94690	377	185	568	42300	282	62540	
MCD098	LW-4	AQ	ug/L	91190		25	724	5.8		201100	141	94	272	251300	105	17530	
MCD099	LW-24	AQ	ug/L	101900		92F	951	13		90860	299	202	568	454000	280	64230	
MCD100	AQ BLANK	AQ	ug/L	164										44			

NOTE: For a review of this data and non-target, tentatively identified compounds, please see the Analytical Quality Assurance section of this report.

◇ Denotes results of questionable qualitative significance based upon quality assurance review of data.

— Quality Assurance performed by Rock —
— J. Vitale (215) 687-9510. —

SAMPLE DATA SUMMARY
TARGET COMPOUNDS

☐ Organic ☒ Inorganic

Site Name OSBORNE DISPOSAL
Date of Sample 9/24/85 - 9/26/85

D Number E3-8508-37
A Number PA 681

Solid sample results reported as dry weight.

Sample Number	Sample Description and Location	Phase	Units	Manganese	Mercury	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Tin	Vanadium	Zinc	Cyanide	Percent Solids (%)	Remarks
														11			
MD130	BAILER BLANK	AQ	UG/L										22	48		84.1	
MD088	5-1	SOLID	MG/KG	303		17		N 5.8 F			5.8 F		25	37		85.6	
MD086	5-9A	SOLID	MG/KG	395	.58								31	68		80.0	
MD082	5-9	SOLID	MG/KG	1590		13							29	70		78.5	
MD083	5-9B	SOLID	MG/KG	685		16		2.5					17	85		84.2	
MD084	5-6	SOLID	MG/KG	1031		24						15	18	108		59.4	
MD085	5-5	SOLID	MG/KG	675		28						35	38	85		78.9	
MD086	5-7A	SOLID	MG/KG	434		27			4.2				32	66		82.8	
MD087	5-7	SOLID	MG/KG	380		12			5.0				13	64		85.8	
MD088	5-4A	SOLID	MG/KG	396		15							17	91		65.3	
MD089	5-4	SOLID	MG/KG	384		29	229						22	95		82.7	
MD090	5-2	SOLID	MG/KG	657		33	215						14	72		91.7	
MD091	5-B(1"-6")	SOLID	MG/KG	547		17							13	71		93.5	
MD092	5-B(6"-12")	SOLID	MG/KG	589		18											

NOTE: For a review of this data and non-target, tentatively identified compounds, please see the Analytical Quality Assurance section of this report.

— Quality Assurance performed by Rock
— J. Vitale (215) 687-9510.

SAMPLE DATA SUMMARY
TARGET COMPOUNDS

☐ Organic ☒ Inorganic

Site Name OSBORNE DISPOSAL
Date of Sample 9/24/85 - 9/26/85

DD Number F3-8508-37
PA Number PA 681

T-17003

Solid sample results reported as dry weight.

Compounds Detected

Sample Number	Sample Description and Location	Phase	Units	Manganese	Mercury	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Tin	Vanadium	Zinc	Cyanide	Percent Solids (%)	Remarks
MCDM4	TP-14	SOLID	mg/KG	399		22◇						15	48			88.7	
MCDM5	TP-4BD	SOLID	mg/KG	360		33◇	345◇					59◇	18	77 F	.28 F	89.0	
MCD145	TP-4BD	SOLID	mg/KG	360		33◇	345◇					415	28	663		36.8	Note % solids
MCD146	S-3(1"-6")	SOLID	mg/KG	343	1.1	94◇						353 F	51	1715		27.9	
MCD147	S-3(6"-12")	SOLID	mg/KG	736	1.3	237◇						9.8				100.0	
MCDM8	BLANK	SOLID	mg/KG			12	226										
MCD149	TP-15	SOLID	mg/KG	196		27◇						22◇		179	.27	93.3	
MCD151	TP-17	SOLID	mg/KG	1349	.23	136						15◇	30	579		84.3	
MCD152	TP-18	SOLID	mg/KG	748		37◇	309◇					13◇	24	74	.45	89.2	
MCD153	TP-19	SOLID	mg/KG	1464		70◇	237◇					22◇	36	132		63.6	
MCD094	LW-1	AQ	UG/L	503		36◇	3013			24280				93			
MCD095	LW-2	AQ	UG/L	11810		446	3150 F			72879			309	1207			
MCD096	LW-4	AQ	UG/L	5093		235	5383			9515◇			182	817			
MCD097	LW-2A	AQ	UG/L	11490	.18 F	448	4690 F			8058◇			328	1226			
MCD103	BLANK	AQ	UG/L	13			402										

NOTE: For a review of this data and non-target, tentatively identified compounds, please see the Analytical Quality Assurance section of this report.

Quality Assurance performed by Rock
J. Vitale (215) 687-9510.

...qualitative significance based upon quality assurance review of data.

SAMPLE DATA SUMMARY
TARGET COMPOUNDS

☐ Organic ☒ Inorganic

Site Name OSBORNE LANDFILL

Date of Sample 9/24/85 - 9/26/85

DD Number ES-8508-37

PA Number PA 681

Solid sample results reported as dry weight.

Sample Number	Sample Description and Location	Phase	Units	Manganese	Mercury	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Tin	Vanadium	Zinc	Cyanide	Percent Solids (%)	Remarks
			Compounds Detected														
MCD094	S-BA(1"-6")	SOLID	mg/KG	235									22	66		69.7	
MCD095	S-BA(6"-12")	SOLID	mg/KG	257									28	69	.42	71.0	
MCD131	BLANK	SOLID	mg/KG				221									100.0	
MCD154	Filtered LW-1	AQ	ug/L	366			3095			23480				32◇	*		CN- analysis not required
MCD153	Filtered LW-1	AQ	ug/L	3059						8107				48◇	*		
MCD150	Filtered LW-4	AQ	ug/L	773						7272				23◇	*		
MCD157	Filtered LW-2A	AQ	ug/L	3312						6970				14◇	*		
MCD158	Filtered BLANK	AQ	ug/L	47			380							13	*		
MCD159	BAILER BLANK (Fil)	AQ	ug/L				499							25	*		

NOTE: For a review of this data and non-target, tentatively identified compounds, please see the Analytical Quality Assurance section of this report.

Quality Assurance performed by Rock J. Vitale (215) 687-9510.

...ve qualitative significance based upon quality assurance review of data.

8041B

TDD Number F3-8508-37
EPA Number PA 681

SAMPLE DATA SUMMARY
TARGET COMPOUNDS

☐ Organic ☒ Inorganic

Site Name OSBORNE DISPOSAL
Date of Sample 9/24/85 - 9/26/85

Solid sample results reported as dry weight.

Sample Number	Sample Description and Location	Phase	Units	Compounds Detected: Manganese	Mercury	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Tin	Vanadium	Zinc	Cyanide	Percent Solids (%)	Remarks
																	Data Not Received Yet.
C	DRUM #1	SOLID															Data Not Received Yet.
C	DRUM #2	LIQUID															
MCD132	P-3	SOLID	mg/KG	681		17◇							15	46		87.8	
MCD133	TP-10	SOLID	mg/KG	769		43◇							20	82		49.7	
MCD134	TP-2	SOLID	mg/KG	288		26◇								13◇		89.7	
MCD135	TP-5	SOLID	mg/KG	341		23◇							16	70		88.9	
MCD136	TP-4A	SOLID	mg/KG	370		28◇							13	45		92.1	
MCD137	TP-4B	SOLID	mg/KG	409		16◇							12	47◇		90.5	
MCD138	L-1	SOLID	mg/KG	109		28◇								32◇		79.4	
MCD139	L-3	SOLID	mg/KG	181		14◇								27◇		86.1	
MCD140	TP-3	SOLID	mg/KG	247		19◇			4.3◇				13	44	.34	87.3	
MCD141	TP-12	SOLID	mg/KG	1057		47◇						68	20	53	.34	87.6	
MCD142	P-1	SOLID	mg/KG	1773		85◇						903	25	89		49.6	
MCD143	TP-13	SOLID	mg/KG	704	.54	70◇						42◇	.	294		81.7	

NOTE: For a review of this data and non-target, tentatively identified compounds, please see the Analytical Quality Assurance section of this report.

◇ Denotes results of questionable qualitative significance based upon quality assurance review of data.

Quality Assurance performed by Rock
[illegible] (215) 687-9510.

300413

APPENDIX A

2/10/87

1. COST CENTER:	REM/FIT ZONE CONTRACT TECHNICAL DIRECTIVE DOCUMENT (TDD)	2. NO.:
ACCOUNT NO.:		F3-8508-37A

3. PRIORITY:	4. ESTIMATE OF TECHNICAL HOURS:	5. EPA SITE ID:	6. COMPLETION DATE:	7. REFERENCE INFO.:
☒ HIGH ☐ MEDIUM ☐ LOW	550	PA-681	4 wks. after F.W.	☒ YES ☐ NO ☐ ATTACHED ☐ PICK UP
	4A. ESTIMATE OF SUBCONTRACT COST:	5A. EPA SITE NAME:		
	As required	Osborne Disposal		

8. GENERAL TASK DESCRIPTION: Obtain subcontractor & perform sampling at the subject site (ES)

9. SPECIFIC ELEMENTS:

1.) Review background information.
2.) Attend meeting at EPA to determine scope of work requirements.
3.) Prepare required subcontract documents.
4.) Obtain responsible subcontractor to perform the required work.
5.) Document all on-site activities.
6.) Obtain samples at locations directed by EPA/PA DER
7.) Take and ship samples according to standard protocol.
8.) Perform Quality Assurance Review of lab data.
9.) Prepare and submit field trip report including lab data and QA review.

10. INTERIM DEADLINES:

11. DESIRED REPORT FORM: FORMAL REPORT ☐ LETTER REPORT ☐ FORMAL BRIEFING ☐

OTHER (SPECIFY): Refer to the attached for additional information.
Ammendment due to additional hours required for field work and additional hours for QA Reviews.

12. COMMENTS:
County code 085 State Code 042

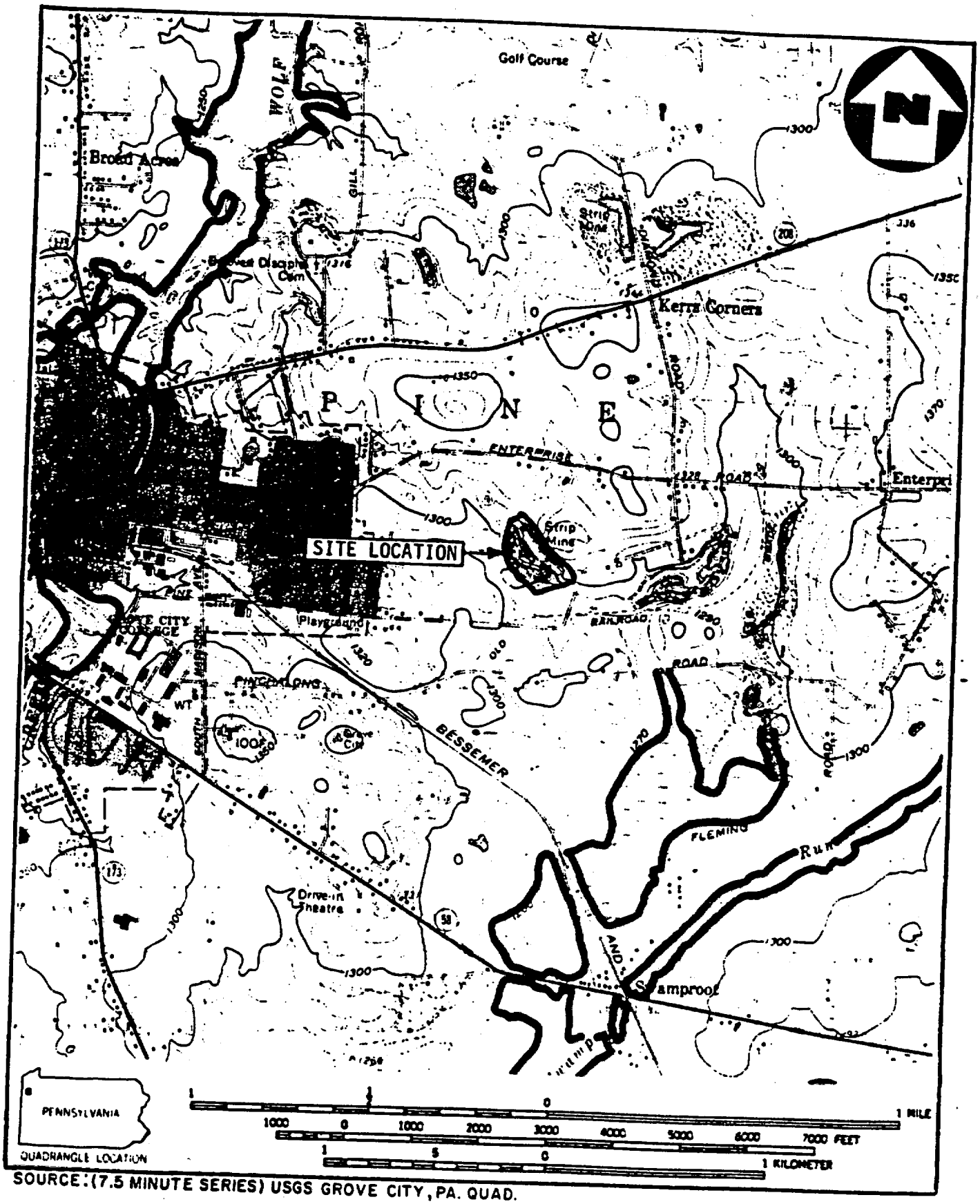
13. AUTHORIZING RPO:	14. DATE:
(SIGNATURE)	

15. RECEIVED BY: ☐ ACCEPTED ☐ ACCEPTED WITH EXCEPTIONS ☐ REJECTED	16. DATE:
(CONTRACTOR RPM SIGNATURE)	

Sheet 1 White – FITL Copy
Sheet 2 Canary – DPO Copy
Sheet 3 Pink – Contracting Officer's Copy (Washington, D. C.)
Sheet 4 Goldenrod – Project Officer's Copy (Washington, D. C.)

300415

APPENDIX B



SOURCE: (7.5 MINUTE SERIES) USGS GROVE CITY, PA. QUAD.

SITE LOCATION MAP

OSBORNE DISPOSAL SITE, GROVE CITY, PA.

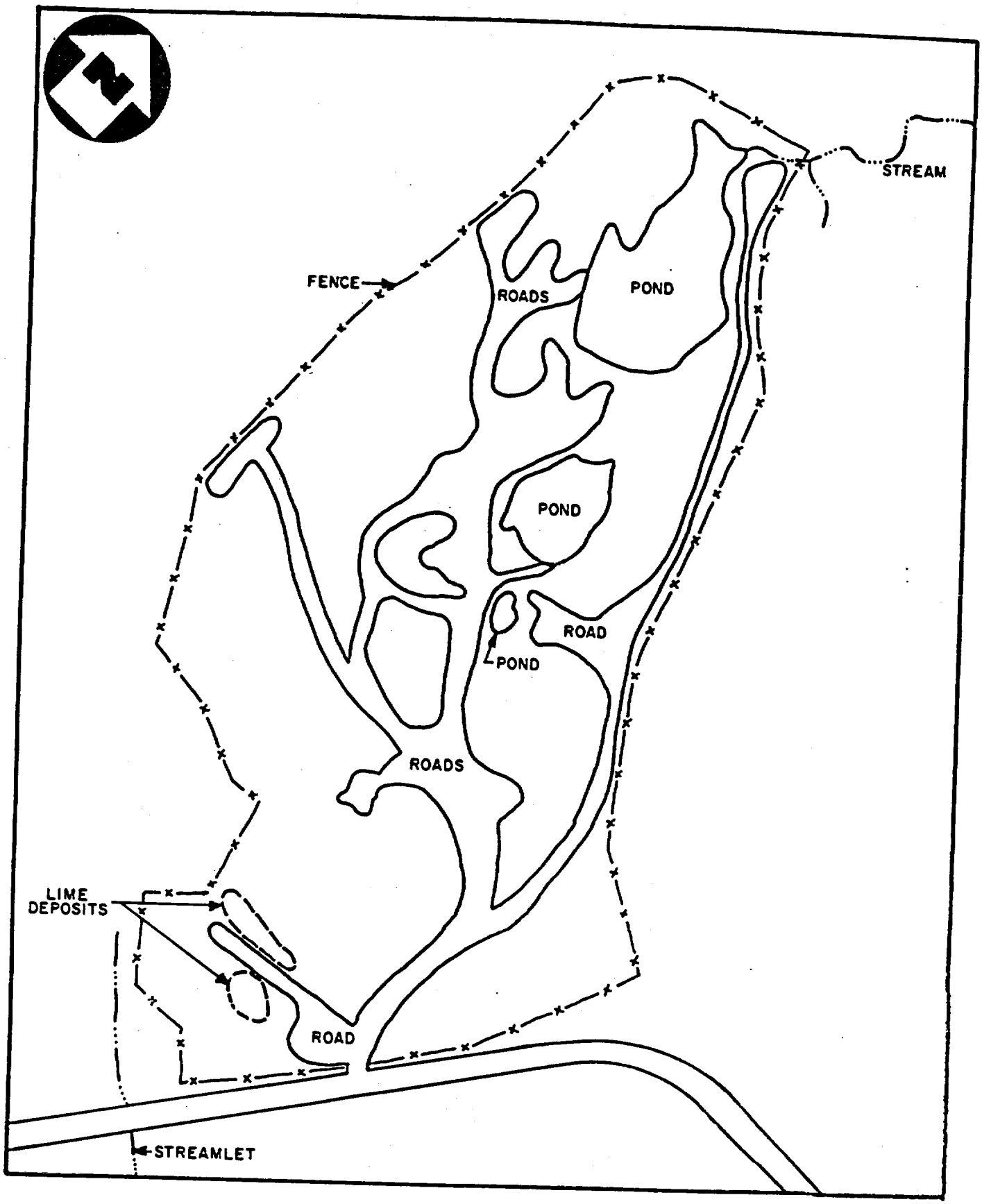
SCALE 1:24000

FIGURE 1

NUS CORPORATION

A Halliburton Company

300417

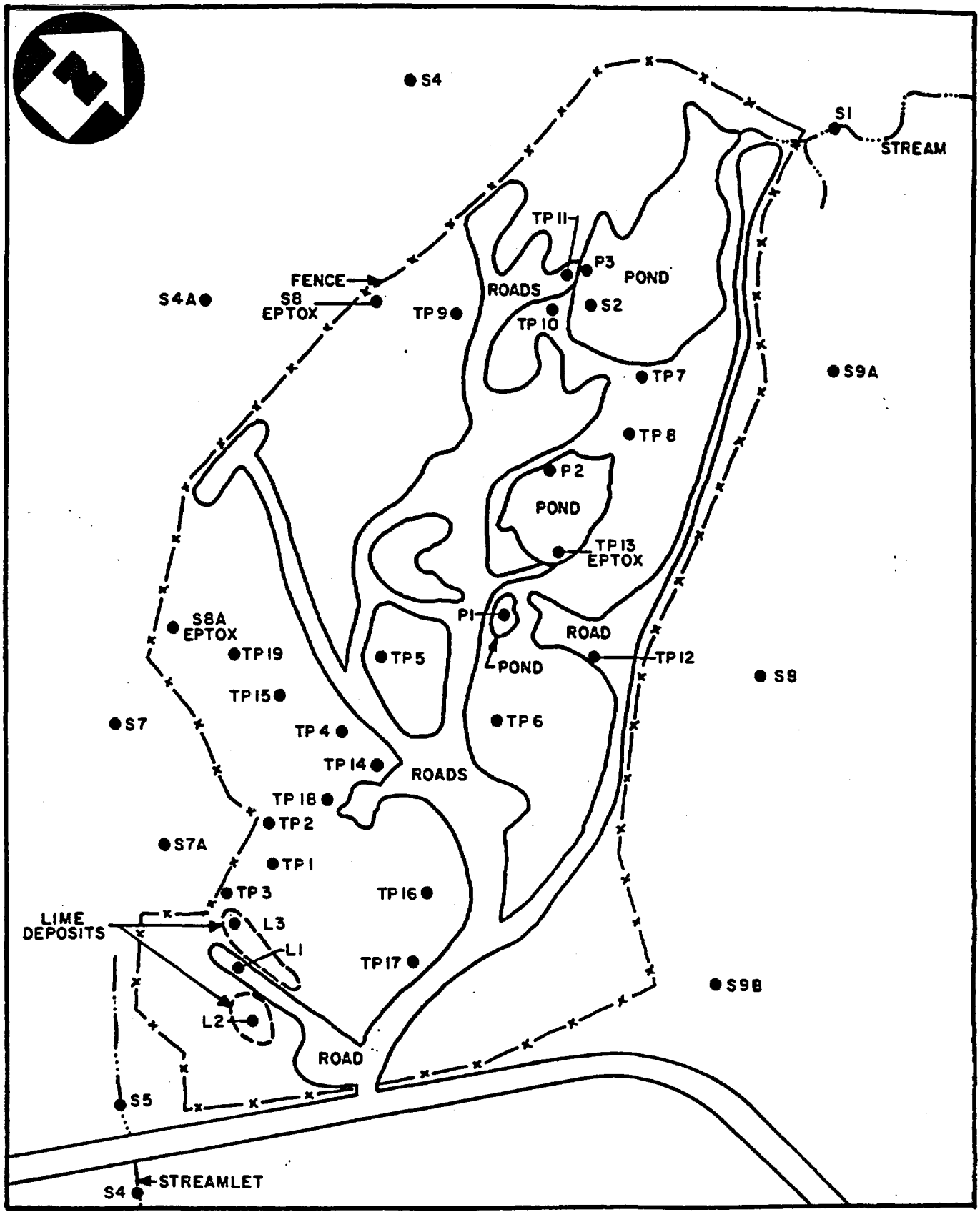


SITE SKETCH
OSBORNE DISPOSAL SITE, GROVE CITY, PA.
(NO SCALE)

FIGURE 2

NUS CORPORATION
A Halliburton Company

300418



SAMPLE LOCATION MAP

OSBORNE DISPOSAL SITE, GROVE CITY, PA.

(NO SCALE)

FIGURE 3

NUS CORPORATION

A Halliburton Company

300419

APPENDIX C

OSBORNE SITE
Remedial Investigation
Report

Prepared For:

Cooper Industries
First City Tower
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Houston, Texas 7210

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June 1984

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CHAPTER I

INTRODUCTION

A. Background

Fred C. Hart Associates, Inc. (Hart), an engineering and environmental consultant specializing in hazardous waste management, has been retained by Cooper Industries, Inc. (Cooper), to conduct a Remedial Investigation at the Osborne Disposal Site pursuant to a Consent Order and Agreement between Cooper and the Commonwealth of Pennsylvania Department of Environmental Resources (DER). Cooper was identified by DER as one of several responsible parties.

Pursuant to the Consent Order and Agreement, a Remedial Investigation Work Plan was negotiated with DER. It was included with the Consent Order and Agreement as "Exhibit A". The work plan was designed to provide the following information necessary for the completion of the Remedial Investigation:

- Types and quantities of waste disposed at the site
- Geologic conditions and soil types present at the site
- Extent of soil contamination at the site
- Groundwater flow direction and gradient
- Groundwater quality
- Surface water quality

In order to accomplish these objectives, the work plan detailed five distinct tasks:

Task 1.0 Indirect Geophysical Investigation.
Task 2.0 Drilling of Initial Test Borings and Wells.
Task 3.0 Sampling Program.
Task 4.0 Analytical Program.
Task 5.0 Data Evaluation and Report Preparation.

Meetings were held between Cooper and the DER at the beginning and end of each task to insure that on-site operations adhered to the Consent Order and Agreement Work Plan. On-site well positions were agreed to by Cooper and DER prior to the start of Task 2.0. DER also made periodic inspections of the work plan performance. No variations to the work plan were allowed without DER approval and subsequent revisions to the Consent Order and Agreement.

Several revisions to the work plan were agreed to between Cooper and DER. Drilling operations at Station N-2, 4+00 encountered potential void spaces; a revision to Task 2.0 with respect to well construction specifications was necessary to insure no cross-contamination between aquifers; Task 6.0, Void Investigation, was initiated to confirm the presence or absence of mine shafts on the hypothesis that the shafts could act as pathways for contaminant migration. As a requirement of Task 6.0, a report was submitted to and accepted by DER.

Variability in chemical data also prompted a second round of sampling in the bedrock wells, and the revision of the Work Plan to include a seventh task. Task 7.0 was implemented to further investigate the Burgoon aquifer system.

Pursuant to the Consent Order and Agreement, this report presents the results of the Osborne Disposal Site Remedial Investigation together with requisite interpretations, conclusions, and an assessment of risk posed by the site to public health and the environment. The remainder of this initial chapter provides introductory material with regard to:

- Site Description
- Initial Site Characterization
- Site Security Program, and
- Contents of this Report

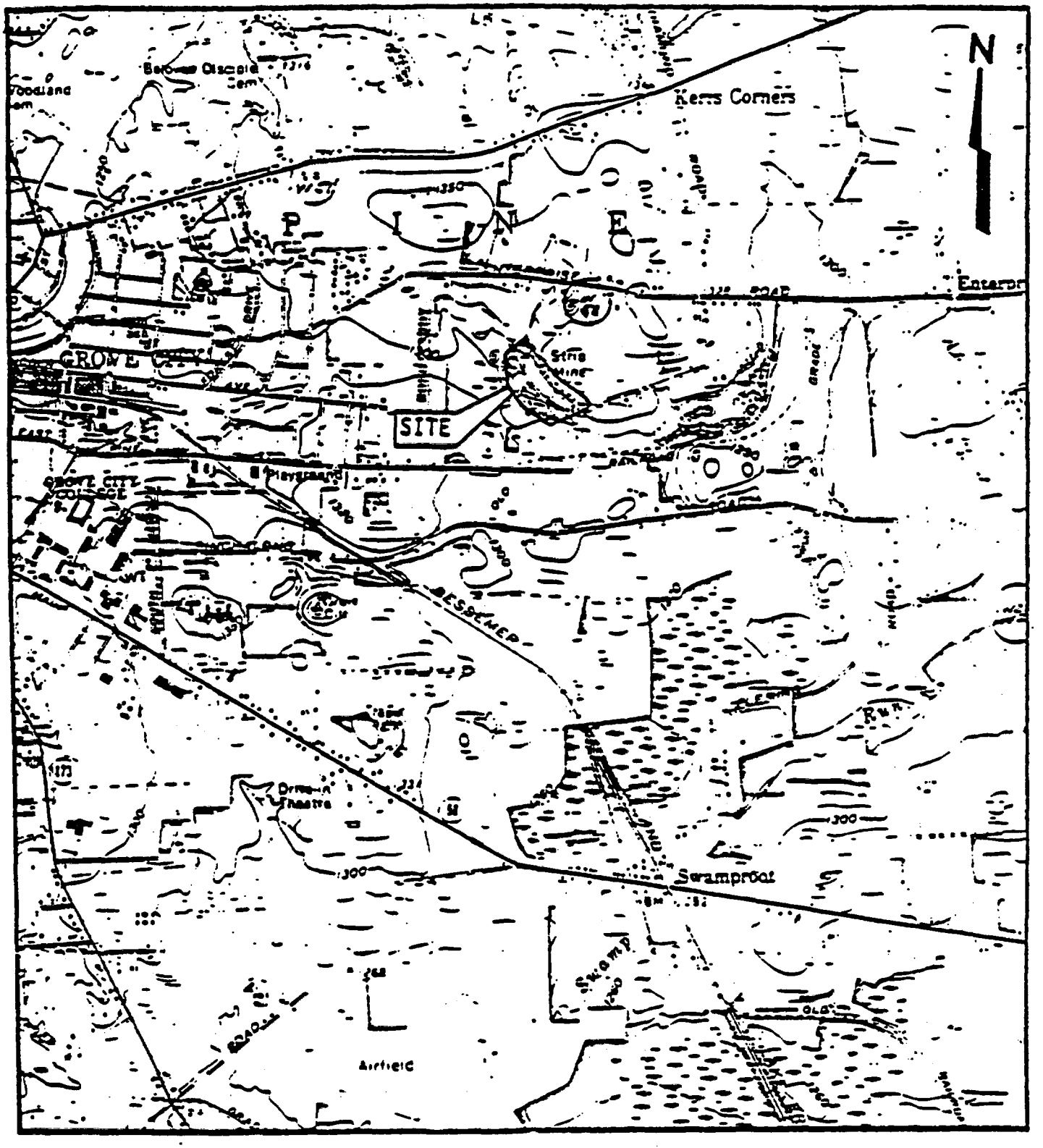
B. Site Description

The Osborne site is located in Pine Township, Mercer County, Pennsylvania, in an abandoned coal strip mine about 15 acres in size. From the 1950s until 1963, Mr. Samuel Mooney operated the site as a disposal area. The operation continued under the ownership of Mr. James Osborne from 1963 until 1978 when the site was closed by the DER.

The Osborne site is situated immediately north of Pine Street Extension, one-half mile east of Grove City, Mercer County, Pennsylvania as shown in Figure I-1. The site received industrial and allegedly potentially hazardous wastes during the 1960s and 1970s. From time to time, the site was used for the disposal of small quantities of miscellaneous debris as well.

Figure 1-2 provides a sketch of the site. In the early 1900s, when the site operated as a coal strip mine, a 1500 foot long pit was excavated in a southeast to northwest direction beginning near Pine Street. Early topographic maps show an elongated pond in the pit between the north and south walls of the stripped area. As a result of subsequent disposal activities, which apparently commenced in the southeast section near Pine Street, only the northwesternmost third of the pond remains. In addition, two smaller ponds are present southeast of the original pond along the base of the highwall to the north. A small intermittent stream enters the north pond from the north. There is no apparent surface drainage out of the pit area. A wetland area and a small stream are located immediately south of the mine spoils pile, and a roadside ditch runs along Pine Street near the site access gate.

Disposed material extends from near Pine Street through the pit to a 5 to 10 foot high cliff of trash and debris adjacent to the large pond. The majority of the material in the pit appears to be dark, coarse foundry sand. Quantities of slag, scrap metal, wood, paper, and plastic matter are found scattered around the entire site.



SCALE: 1"=24,000FT

FIGURE I-1
SITE LOCATION MAP
OSBORNE SITE

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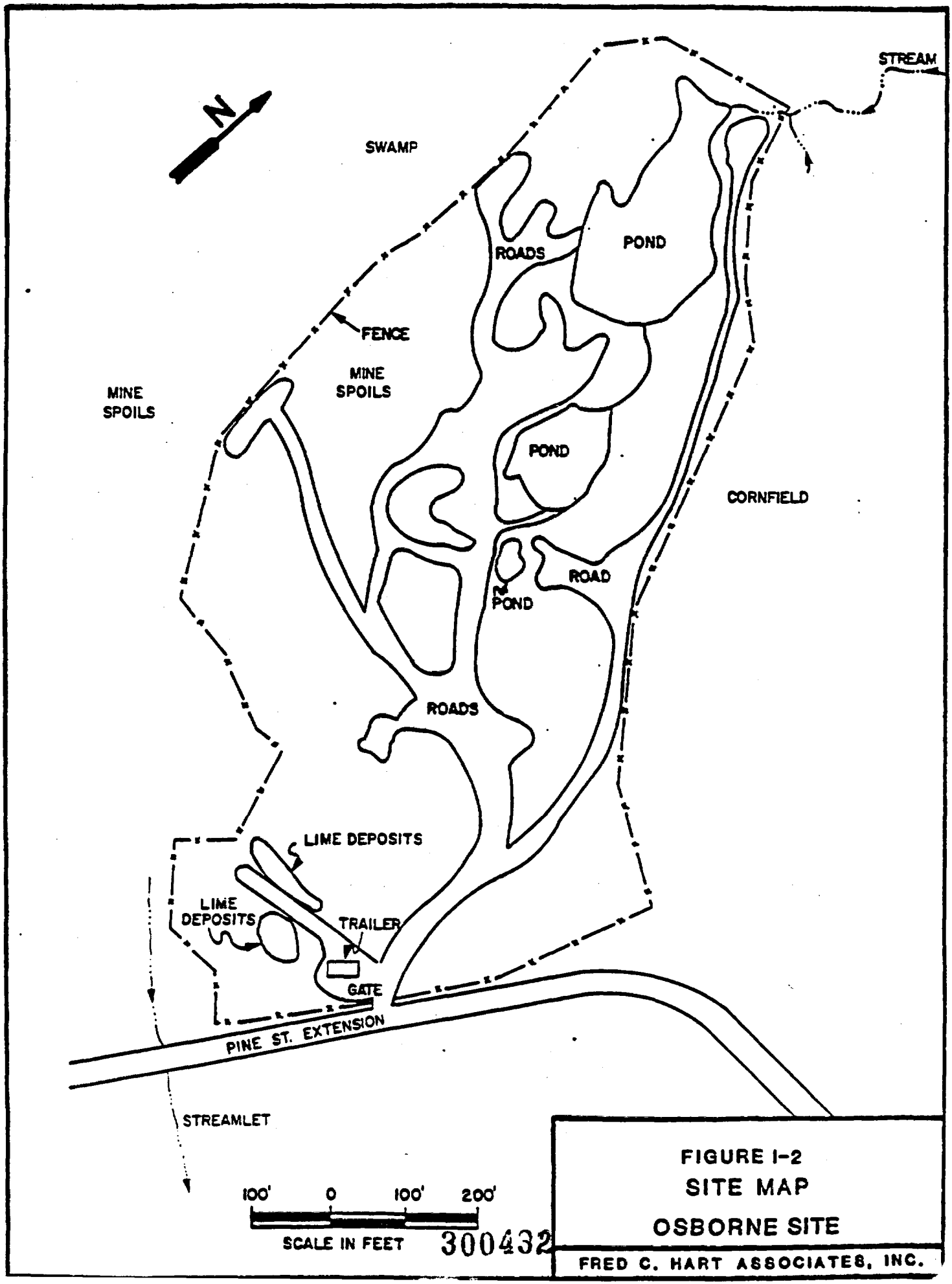

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FIGURE I-2
SITE MAP
OSBORNE SITE

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Prior to initial remedial measures, approximately eighty 55-gallon drums containing unknown materials were scattered about the site. Many of the drums were crushed, rusted or bulged. Approximately 500 empty drums were also present. Additionally, the site contained areas of soil apparently contaminated from leaking drums.

The land immediately surrounding the landfill is agricultural in nature. Effects of the past mining operations are evident near the site. Adjacent to the top of the highwall on the north is a large field owned and farmed by Mr. Ed McDougal, present owner of the Osborne site. The area to the east is mostly wooded. New homes have recently been built to the north, along Enterprise Road. Several older rural homes also exist to the east. South and east of the landfill are low-lying brush and wetlands on both sides of Pine Street.

C. Initial Site Characterization

DER brought the site to the attention of the United States Environmental Protection Agency (EPA) for inclusion under the "Superfund" program following some preliminary sampling by DER and the EPA Region III Technical Assistance Team. EPA subsequently ranked the site using the Mitre Hazard Ranking System. NUS, an EPA contractor, developed a Remedial Action Master Plan (RAMP) for the site. Cooper independently retained Hart to characterize the site.

Hart designed and carried out a preliminary inventory program to identify the types of waste at the site, estimate the quantity of potentially hazardous surface waste, and characterize the degree of hazard. Prior to any on-site activities, a safety plan was developed. Clusters of drums were located and referenced to a grid. Four hundred and thirty three drums were originally identified. Each drum was assigned an identification number and inventoried for volume of material, condition, and possible contents. About 20% of the 74 full, sealed drums were selected for sampling based on drum location, accessibility and condition. Hart fabricated and utilized a remote drum opener in accordance with the site safety plan. The drums were sampled for EP toxicity and disposal parameters and analyzed by Environmental Testing and Certification Laboratories (ETC) in Edison, New Jersey.

Several soil samples were also analyzed. Although the site appeared to pose no danger to on-site personnel, Cooper opted to install a security fence to restrict access by unauthorized personnel. In addition, Cooper wanted to remove surface waste to mitigate any environmental threat posed by these wastes and to facilitate on-site remedial investigatory activities. Hart and Cooper worked closely with EPA and DER to develop the Site Security Program for this purpose.

D. Site Security Program

Cooper, in coordination with EPA and DER, voluntarily started the implementation of Initial Remedial Measures (IRM's) contained in the Site Security Program. This program was conducted during the summer of 1983. A chain link security fence with warning signs was installed by North American Fencing Corporation of Pittsburgh, Pennsylvania around the perimeter of the site. The IRM's also provided for the removal of drums, containers, and soils of a potentially hazardous nature to insure the safety of persons undertaking future activities at the site.

Surface waste removal contractors invited to bid on the cleanup were provided with the results of Hart's initial waste characterization sampling efforts. Associated Chemical and Environmental Services, Inc., (ACES) of Oregon, Ohio was selected as the waste removal contractor. The ACES team included Fondessy Enterprises, Inc., of Oregon, Ohio as the disposal facility; Alert Laboratories, Inc., of Canton, Ohio as the chemical laboratory; Delaware Container company of Coatesville and Keystone Cement Company of Bath, Pennsylvania, as fuels blending facilities; Delaware Container as the treatment facility; and Delaware Container and NY-TREX, Inc., of Richfield, Ohio, as transporters. During the summer of 1983, all visible drums and soil contaminated by leaking drums were removed from the surface of the site.

Following the implementation of the initial IRM's, Cooper and DER entered into a Consent Order and Agreement which provided for the Remedial Investigation of the Osborne Site previously discussed. Hart then conducted the Remedial Investigation (conducted during the period late 1983 to early

1984) which included performing various tasks identified in the Consent Order and Agreement Work Plan to gather information necessary for the selection, design, and implementation of remedial actions at the Osborne Site if appropriate.

A security fence now surrounds the site and the surface of the site is void of potentially hazardous materials. The site also contains a network of groundwater monitoring wells and access roads.

E. Content of the Report

Chapter II of this report summarizes the field investigation activities conducted by Hart. For each activity, the chapter presents the purpose of the task and the methodology used to complete the task. Data gathered under each task are reported as findings; in some cases, extensive raw data and data reduction methods are found in appendices.

Chapter III describes waste types and quantities found at the Osborne site. The chapter presents a waste disposal history at the site, characterizes surface and subsurface wastes and presents conclusions.

Chapter IV addresses environmental impacts posed by surface water. Regional and site drainage patterns and surface water quality are discussed. Surface water users and potential contaminant migration pathways are identified.

Chapter V describes the environmental impacts posed by groundwater. Regional and site hydrogeologic information is reported. Groundwater users and potential groundwater contaminant migration pathways are identified. Groundwater quality is discussed.

Chapter VI synthesizes all the data gathered and examines the risks posed by the Osborne site to public health and the environment in a risk assessment.

Chapter VII summarizes the conclusions reached in the report.

CHAPTER II

SUMMARY OF FIELD INVESTIGATION ACTIVITIES

The Consent Order and Agreement Work Plan for the Remedial Investigation at the Osborne site was designed to provide adequate information to determine the appropriate remedial actions to be undertaken at the site. The specific objectives at the Remedial Investigation and the tasks necessary to complete these objectives are discussed in Chapter I of this report. This chapter provides a summary of field investigation activities designated by these tasks, which were conducted at the Osborne site. The purpose, methodology, findings, and conclusions are presented for the following investigative activities:

A. Proton Magnetometry Survey
B. Electrical Resistivity Survey
C. Test Drilling
D. OVA Field Analysis
E. Geophysical Borehole Logging
F. Downhole Television Inspection
G. Aquifer Testing (Pressure Testing)
H. Pumping Test of Well CPW-1
I. Monitoring Well Installation
J. Survey Work
K. Sampling

The above investigative activities were carried out in accordance with the Consent Order and Agreement Work Plan. DER approvals were obtained prior to the commencement and at the conclusion of each task. All work was completed in accordance with the safety plan drafted for the site prior to the commencement of on-site investigative activities. All drilling activities followed the safety plan. All on-site personnel were trained in the use of respiratory protection, including the cartridge respirator and the Self Contained Breathing Apparatus. An Organic Vapor Analyzer and an Explosimeter were used to monitor conditions around the drill rigs during all on-site operations.

A. Proton Magnetometry Survey

1. Purpose

Hart conducted a standard proton magnetometry survey at the Osborne site to indicate the number, locations, and types of buried metal objects at the site.

2. Methodology

An EG&G Geometrics model G846 portable proton precession magnetometer was utilized to conduct a magnetic search. General calibration of the unit to the earth's magnetic field was accomplished by consulting a map of the total intensity of the earth's magnetic field. A reference point known to be free of possible sources of magnetic interference was chosen.

The point was located in the field to the east of the main gate (See Figure II-1). Each 100 foot square block on the onsite grid was surveyed on a sub-grid using a grid spacing of 20 feet. The reference point was returned to after each section of the landfill was surveyed so that diurnal changes in magnetic field could be recorded. At each grid point a measurement was taken. High magnetic gradients resulting in an unstable magnetic field were indicated automatically by the magnetometer. In addition, magnetic surface interference maps were constructed (See Figure II-2).

Repeatability of the measurements was checked before, during and after the survey and found to be in the range of ± 2 gammas. Correction for diurnal magnetic field changes was not necessary due to the lack of magnetic field variation at the reference point over the course of the survey.

3. Findings

Magnetic modeling normally used to identify the sizes, depths, and types of objects causing magnetic anomalies was not possible. Under normal conditions, the occurence of a buried metal object will produce a particular magnetic moment and signature that can be used to determine the size, shape

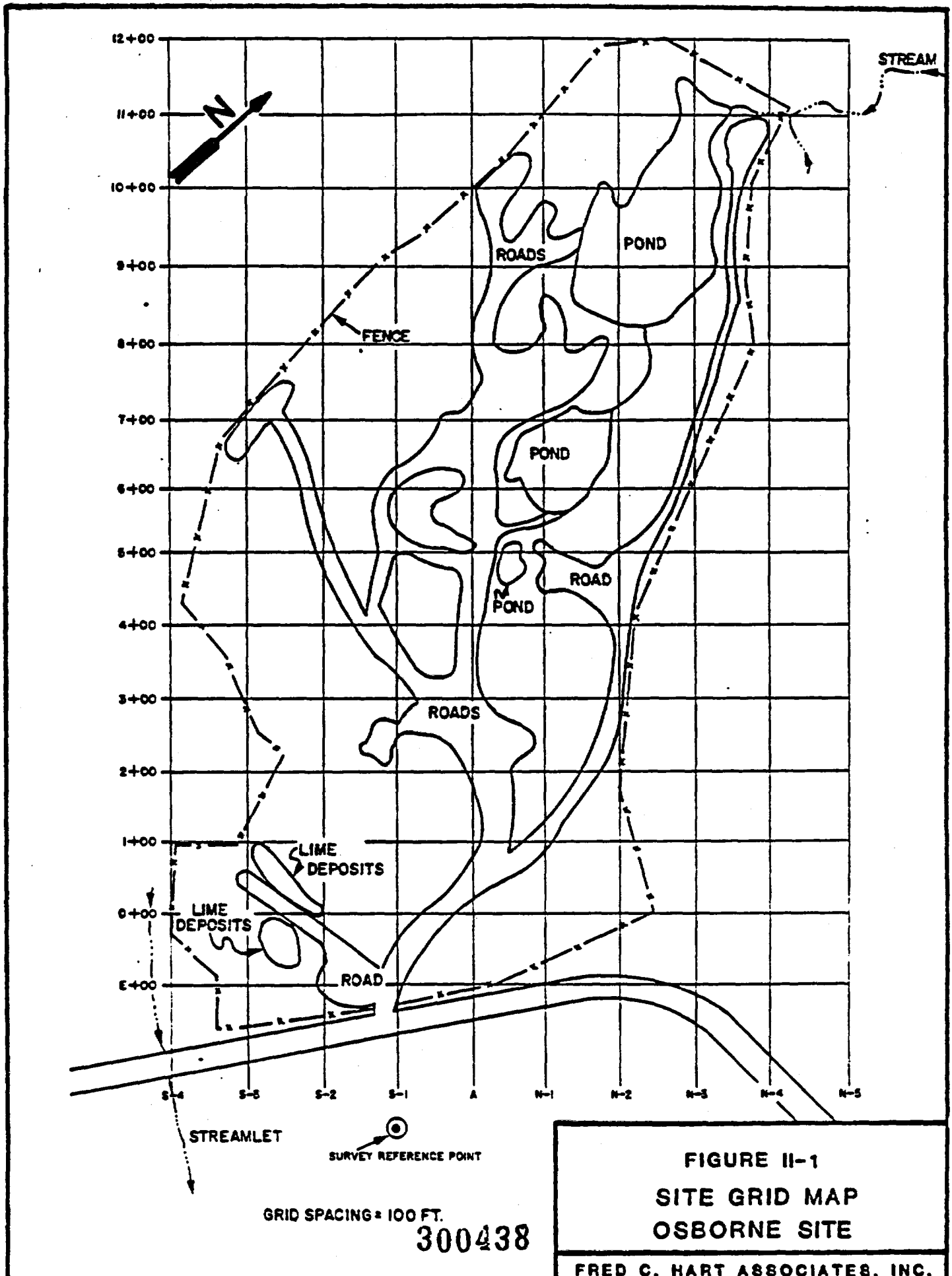

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FIGURE II-1

SITE GRID MAP

OSBORNE SITE

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and depth of the object. At the site, large masses of metal caused regions of high magnetic gradients which resulted in unstable magnetic fields. This degraded the signals recorded by the magnetometer, preventing accurate interpretations. Interpretation was still possible, however, by mapping regions of high magnetic gradients (see Figure II-3). An estimation of the possible locations of large amounts of buried ferromagnetic materials was made by subtraction of regions with sufficient ferromagnetic or electrical surface interference from the regions of high magnetic gradients (see Figure II-4).

4. Conclusions

The magnetometry survey suggested that buried ferromagnetic materials were present throughout the entire central area of the disposal site. Modeling could not determine the sources of the anomalies recorded in the area. Due to the large amount of metallic materials disposed of at the site (i.e. scrap metal, foundry sand, etc.) it was not possible to determine the types of objects buried at the site.

B. Electrical Resistivity Survey

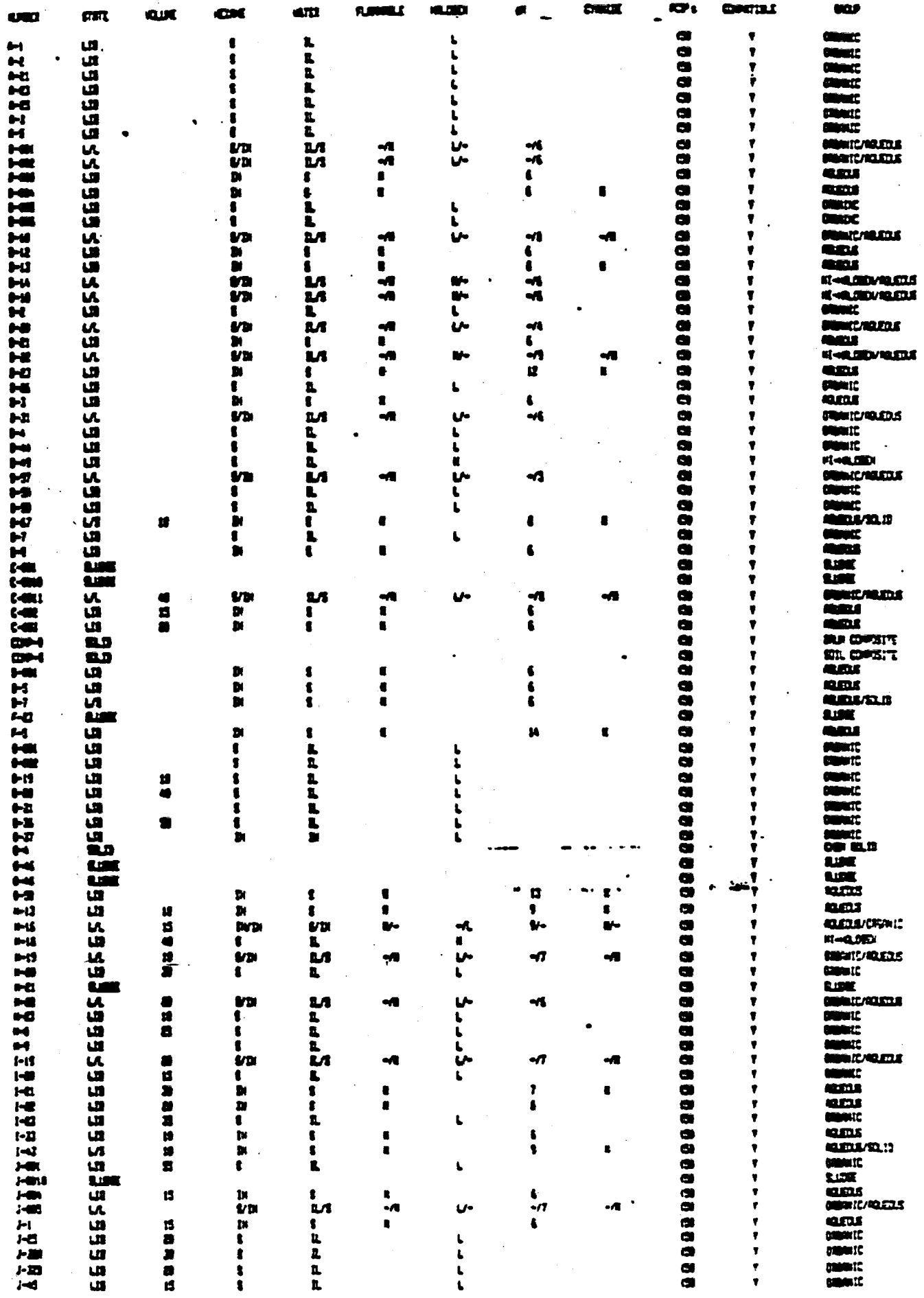
1. Purpose

Hart performed an electrical resistivity survey as a prescreening tool to indicate subsurface geologic conditions around the perimeter of the site. Electrical Resistivity is commonly used to check for the presence of shallow groundwater contamination plumes and geologic features such as soil types and thicknesses.

2. Methods

The instrument used to perform the survey was a Bison Earth Resistivity Meter (Model 2350 B). Two parallel survey lines separated by approximately 100 feet were run around the perimeter of the site as shown in Figure II-5.

Table III-3
Summary of Drum Analyses



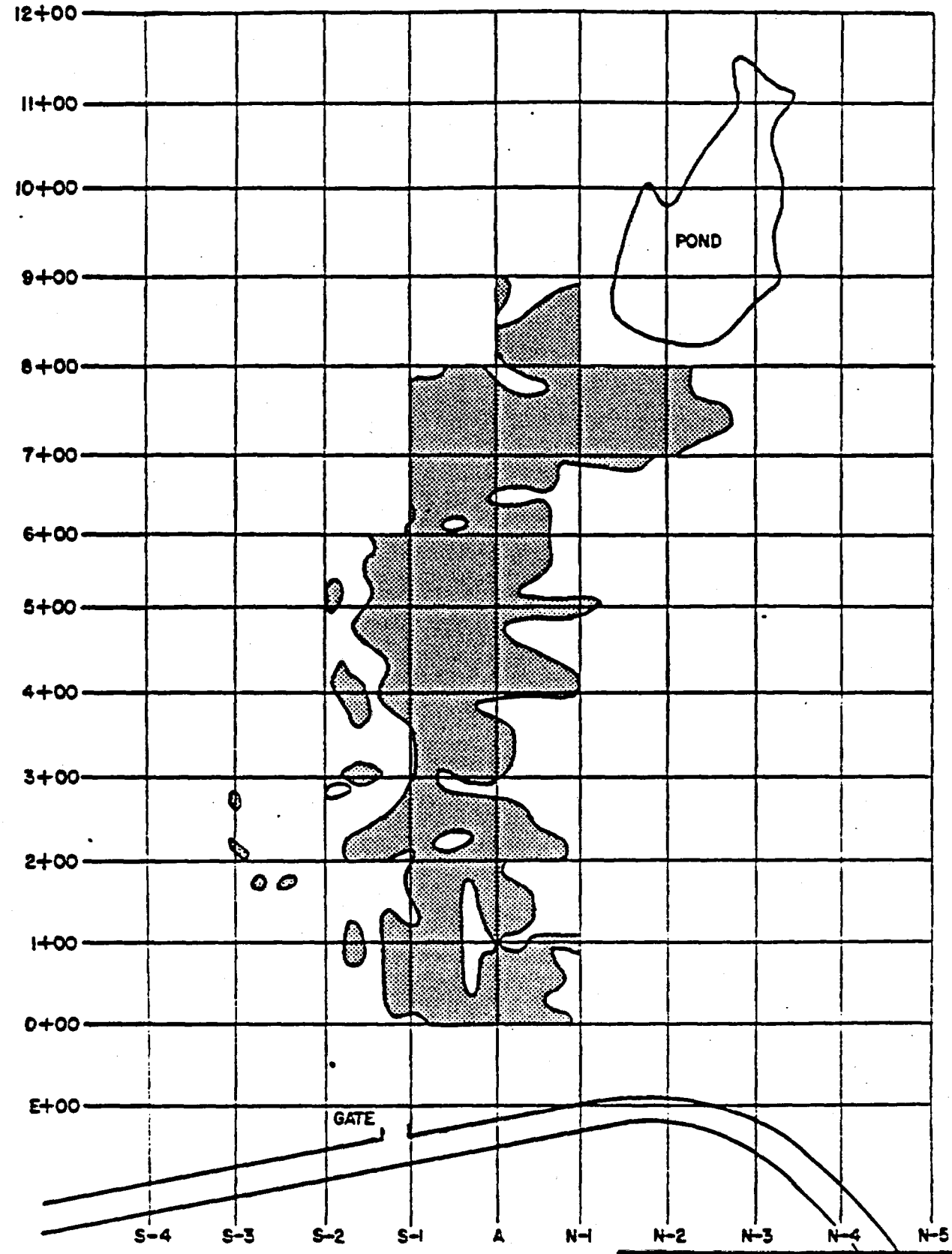
Source: ACES, 1983

TABLE III-4

SUMMARY OF FONDESSY PRIORITY POLLUTANT COMPOSITES

Sample Description	Ethyl-benzene (%)	Ortho-xylene (%)	Ethyl-methyl benzene (%)	Assorted Hydro-carbons (%)	Arsenic mg/kg	Barium mg/kg	Cadmium mg/kg	Chromium mg/kg	Hexavalent Chromium mg/kg	Lead mg/kg	Mercury mg/kg	Selenium mg/kg	Silver mg/kg	Nickel mg/kg
Organic Liquid	0.2	0.2	-	-	LT 0.025	5.0	0.4	20.0	LT 0.1	4,400	LT 0.1	LT 0.25	0.35	2.3
Organic Liquid Hi-Halogen	0.5	0.2	-	-	0.045	7.5	0.75	1.5	LT 0.1	20	LT 0.1	LT 0.25	0.3	1.0
Sludge	0.3	0.5	0.5	-	1.0	30.0	8.0	450.0	LT 0.1	830	LT 0.1	LT 0.25	0.2	48.0
Aqueous Liquid	LT 100	-	-	-	LT 0.05	0.4	0.04	0.14	LT 0.1	1.4	LT 0.05	LT 0.05	0.04	.68
Solid Drum Composite	LT 0.1	-	--	0.5	2.0	37.0	0.65	34.0	LT 0.1	79.0	LT 0.01	LT 0.25	LT 0.05	70.0
Solid Soil Composite	LT 0.1	0.5	1.0	3.0	2.3	39.0	0.7	20.0	LT 0.1	75.0	LT 0.1	LT 0.25	13.0	39.0

LT - Less than
- - Analysis was not run



GRID SPACING = 100 FT.

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FIGURE II-3
HIGH MAGNETIC FIELD
GRADIENT MAP
OSBORNE SITE

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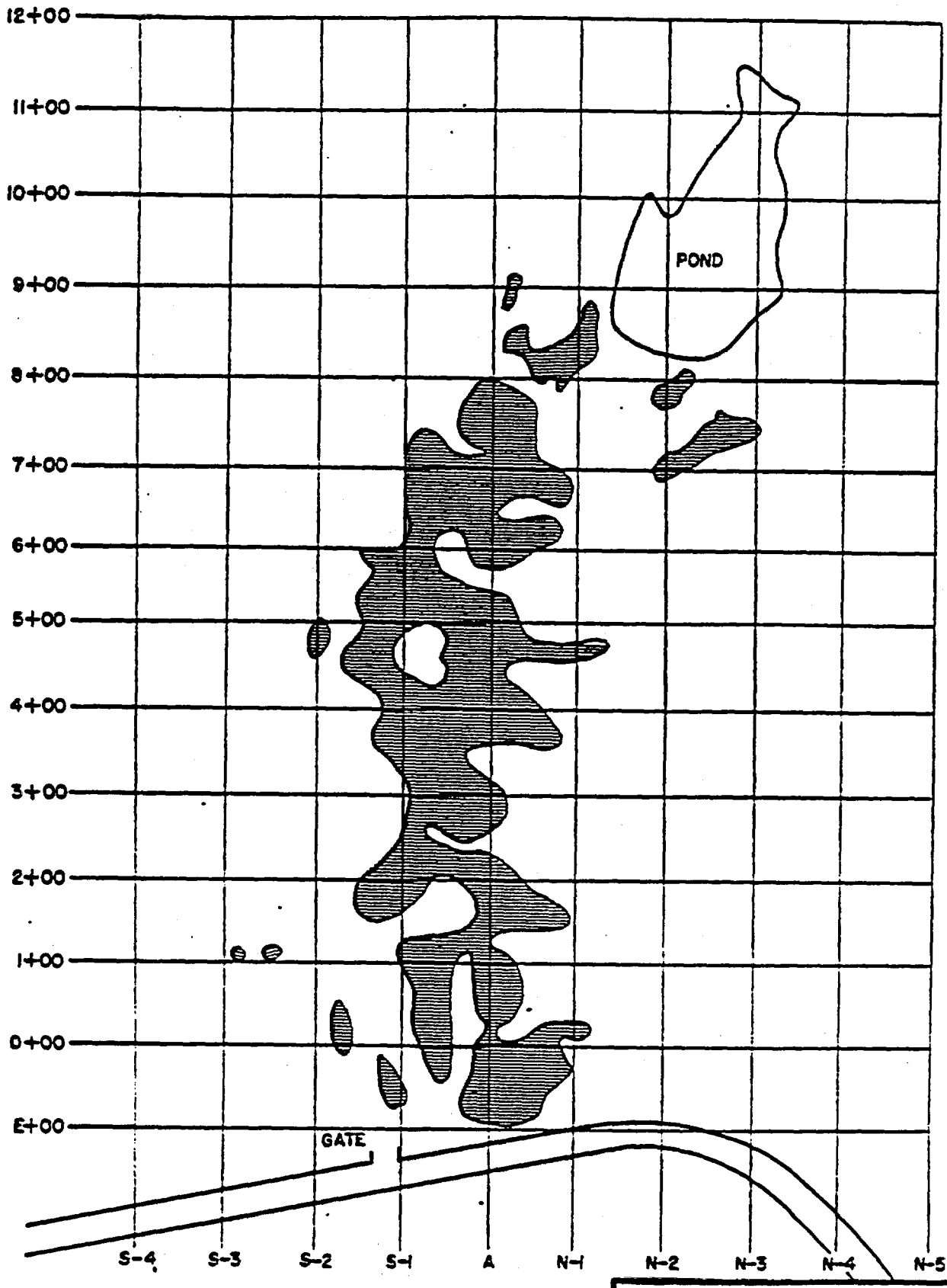

GRID SPACING = 100 FT.

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FIGURE II-4

MAP OF POTENTIAL AREAS OF BURIED METAL OSBORNE SITE

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A constant "A" spacing, or separation of 100' between the current and potential electrodes, was maintained throughout the survey. Dial readings were recorded and multiplied by the electrode spacing to obtain an apparent resistivity value at each station.

3. Findings

Figure II-6 shows apparent resistivity profiles for the two parallel lines around the site. Readings taken near the pond or swamp areas tend to show a lower resistivity due to the proximity of water.

4. Conclusions

The consistency of the values indicated that there were no anomalies (i.e. unusually high or low measurements) in the immediate vicinity of the site. These results suggest that soil types and thicknesses are uniform in the area immediately surrounding the site. In addition, the results also suggest the absence of shallow mine shafts (less than 50 feet deep) and indicate the absence of obvious plumes of shallow groundwater contamination.

C. Test Drilling

1. Purpose

Hart completed the drilling of a total of 19 test borings and wells at the locations shown in Figure II-7 to determine the geologic conditions and soil types present at the site. The specific purpose for each series of borings and wells is stated in the Consent Order and Agreement Work Plan and their precise locations, depths, and constructions were approved by DER.

2. Methods

Hart hydrogeologists directed, supervised and inspected the drilling of 19 test borings and wells at the site. Hart personnel made observations and measurements of all sampling activities and materials, and kept records in daily log books and on log forms.

Subsequent sampling and laboratory analysis showed that no priority pollutant compounds were present in the well, indicating that this compound was not a priority pollutant. Since this well is located in a coal mine spoils pile, there is a strong possibility that this compound is a derivative of coal.

LW-1 Based on the prescreen, all samples collected from LW1 showed the presence of volatile organic compounds. Concentrations ranged from 10 to 100 ppm* in the interval from 0 to 31.5 ft., and were 1000 ppm or higher in the interval from 31.5 to 37.5 ft. In all cases the GC analyses of these samples showed peaks exhibiting the characteristics of methane at concentrations generally correlating with the concentrations noted in the prescreen. Sample No. S-6 showed a low level of volatile organic contamination apart from the methane peak. Based on the characteristics of the split spoon samples, it appears that the methane is being generated from the decomposition of fill material. This is especially true for the interval from 31.5 to 37.5 ft. which had large amounts of root material and wood.

LW-2 - The prescreen results of samples taken from LW-2 generally showed concentrations in the 10 to 70 ppm* range in the interval from 0-22.5 ft, and, except for sample no. S-20, were clean in the interval from 22.5 to 30 ft. In all cases where GC analyses were conducted, the analysis resulted in a small peak exhibiting the characteristics of methane. Sample No. S-9 showed a low level of volatile organic compound apart from the methane peak. As in LW-1, it appears that the methane in this boring is being generated from the decomposition of the fill and/or spoil material. Methane concentrations in this boring are generally lower than those noted in LW-1. This is probably due to the decreased amount of organic matter observed in this boring.

LW-3 - Prescreen results from sample nos. S-1 through S-10 taken in the interval from 0 to 15 ft were clean. Prescreen results from sample nos. S-11, S-12 and S-13, in the interval from 15 to 19 ft

showed volatile compound concentrations in the 20 to 80 ppm* range. GC analyses on these samples resulted in a small peak exhibiting the characteristics of methane. No other peaks were noted. However, field observations of sample nos. S-11, S-12, and S-13 indicated that these samples were contaminated with an oil-like substance and exhibited an oily odor. It is possible, based on this observation, that the compound noted was not methane, but rather some other light compound or combination of compounds associated with non-chlorinated hydrocarbon products. Water in well LW-3 was subsequently sampled and analyzed for volatile organic priority pollutants. Only benzene, an aromatic hydrocarbon, was found at part-per-billion levels, indicating that the remainder of this combination is probably due to non-chlorinated alphatic hydrocarbons. Note that non-chlorinated alphatic hydrocarbons are generally not considered to be priority pollutants.

LW-4 - All samples taken from LW-4 were clean.

4. Conclusions

The OVA was useful in the determination of the zones of subsurface soil contamination and the proceedures required in setting the proper depth of the well screen. OVA logs are provided in Appendix B. The OVA field screening supports the boring log information on the extent of the disposed material. The OVA logs indicate that volatile organic concentrations were generally higest below the water table. Disposed materials above the water table checked with the OVA appeared to be relatively clean, suggesting that there is relatively little subsurface soil contamination. LW-1 and LW-3 reflect the chemical composition of the leachate in the fill. The major organic component identified by the OVA appeared to be methane. Analyses of these leachate samples with the OVA was only a prescreening technique used to indicate possible zones of contamination. Subsequent laboratory analyses confirms that any non-methane organic compounds found in the leachate are generally non-priority pollutant compounds.

E. Geophysical Borehole Logging

1. Purpose

Hart performed the geophysical borehole logging of well DMW-1 and holes DMW-2 and DMW-3 to confirm the depths of formations and geologic contacts. Geophysical borehole logging was utilized in boreholes DMW-2 and DMW-3 to provide geologic control data in lieu of rock cores in these locations. DMW-1 was logged for comparison with the geologic log of the continuous rock core at that location. Geologic control in these holes aided in the interpretation the lithology in and between the holes so that zones could be identified for subsequent permeability testing.

2. Methods

Hart directed Applachian Coal Surveys (ACS) of Pittsburgh, PA in the geophysical logging tasks at the Osborne Site. Several logging suites were run. DMW-2 and DMW-3 were logged using full standard lithologic and groundwater logging suites.

These open hole suites consisted of spontaneous potential and resistivity electric logging, natural and gamma ray logging, density logging, caliper logging, and temperature and fluid conductivity logging. DMW-1, as a cased hole, was logged using only natural gamma and density logs. The presence of the well casing prevents quantification of the density log, although the log may be used for qualitative interpretation. ACS provided the complete geophysical logging system from Well Data Reconnaissance of Dallas, Texas mounted in a light truck. Each probe was calibrated at each well before the run. Logging speed was held at about 30 feet per minute. Logging results were simultaneously recorded on stripchart paper.

3. Findings

Appendix C includes the results of the various logging suites for the three holes. The elevations of the formations and formational contacts were carefully derived from the geophysical logs, recovered rock cores, and

drillers records. This information was utilized to delineate zones for later permeability testing.

4. Conclusions

This technique permitted utilization of an additional lithological interpretative technique to compare geophysical borehole logs with recovered rock cores. Geophysical logging aided in the correlation of geologic formations (i.e., aquifers and aquicludes) across the site at locations and depths at which rock coring data was not available. The geophysical logs were also used to compare the site to other areas offsite for which logs were available (e.g., Poth, 1963).

F. Downhole Television Inspection

1. Purpose

Hart conducted an inspection of borehole CMW-1 utilizing a downhole television camera for the purpose of characterizing potential void areas encountered during drilling.

2. Method

Geoprobe Inc., of Pittsburgh, PA was subcontracted to perform the downhole TV inspection. A camera specifically designated for this type of work was coupled with one of two types of lens attachments. First, the hole was logged with the side looking attachment. Then, the hole was logged for a second time with a down looking attachment. A video tape was made of the entire process for data review and evaluation.

3. Findings

At a depth of 68.5 ft below ground level, what appeared to be the ceiling of a mine was viewed. Further advancement of the camera could not be accomplished due to collapse and in-filling of material in the borehole.

Sediment clouding the water prevented an estimation of the extent of the void. However, Figure II-8 shows various zones of broken up rock characteristic of roof collapse or subsidence.

4. Conclusions

The borings and subsequent inspection suggest the possibility that at least one mine shaft exists on the northeast side of the site. However, it is likely that, as the mine roof subsided, small void areas were opened in the collapsing rock above, and these small voids were filled with collapsed, broken and loose rock material creating the zones noticed on the video monitor.

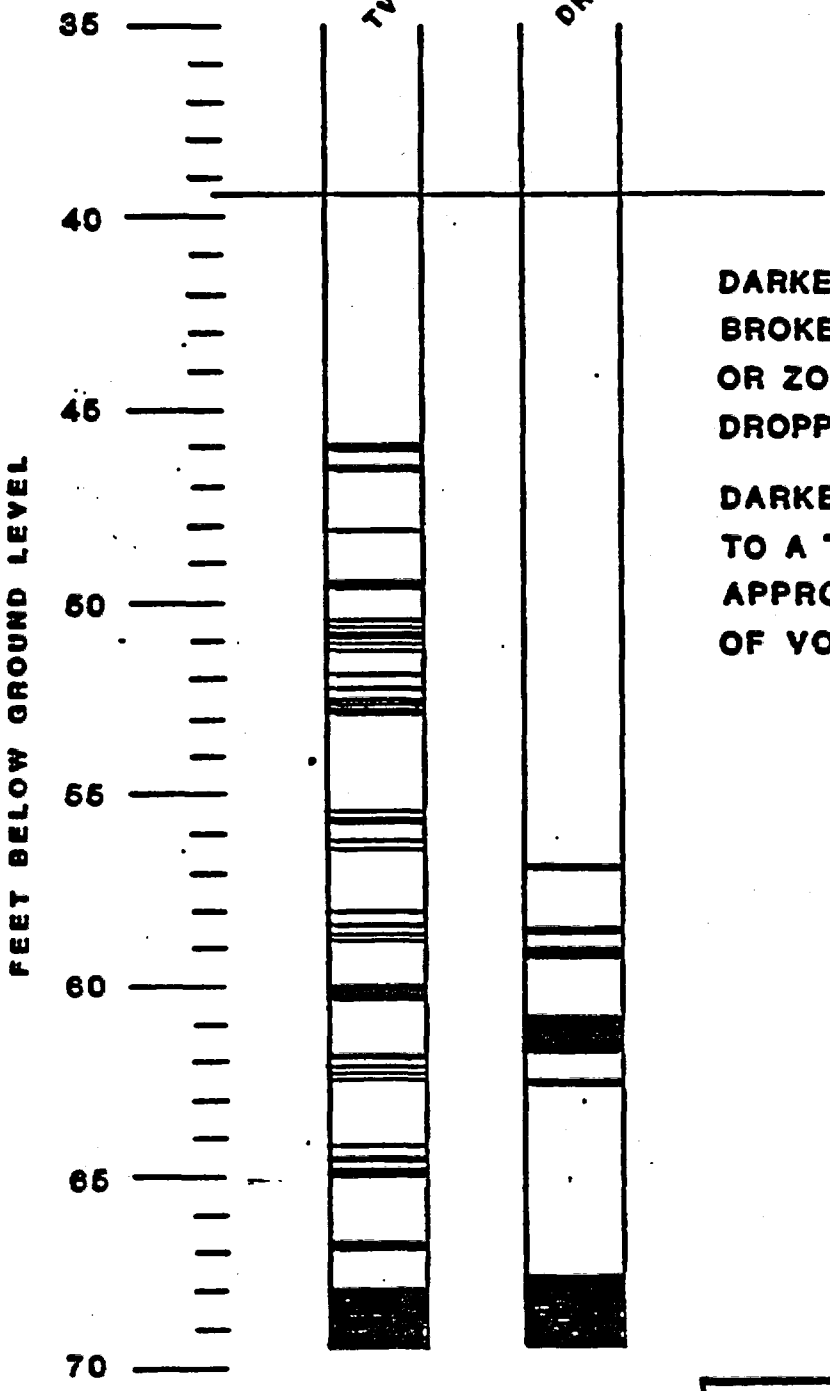
G. Aquifer Testing

1. Purpose

Hart conducted pneumatic packer testing of each of the lithologic units open in drill holes DMW-2 and DMW-3 to determine the permeabilities of these units. Pneumatic Packer Testing is the most appropriate method of measuring the in-situ permeability of a rock at depth. Permeability, the capacity for a material to transmit fluid, is the single most important factor controlling groundwater movement. Aquifers whether in rock or soil typically exhibit high permeabilities and can serve as pathways for contaminant migration. Confining layers, or aquicludes, exhibit low permeability and may act to slow or stop contaminant migration through groundwater. Through permeability testing, the ability of each zone of rock to act as a barrier or pathway to transmit contaminants through groundwater to receptors can be evaluated.

2. Methods

Hart directed Lininger to perform packer testing of the various aquifers and confining layers opened in drill holes DMW-2 and DMW-3. Depth of zones to be tested was determined utilizing core logs,geophysical logs and drillers logs. At least one zone representative of each sand or shale lithologic unit was chosen for testing.



DARKENED AREAS INDICATE BROKEN ROCK AND VOID SPACE OR ZONES THAT DRILL RODS DROPPED THROUGH

DARKENENED AREAS AMOUNTED TO A TOTAL THICKNESS OF APPROXIMATELY FOUR FEET OF VOID SPACE

FIGURE II-6
BOREHOLE CMW-1
TELEVISION LOG RESULTS
OSBORNE SITE
FRED C. HART ASSOCIATES, INC.

The packer assembly was lowered to the proper zone. The packers were inflated to the proper pressure with compressed air utilizing tanks from self contained breathing apparatus units. This isolated the five foot zone of bedrock between the two packer units. Water was then pumped into the zone at a low and constant pressure, creating a constant artificial head. Operating pressures were stabilized with the use of a gate valve until they remained constant. Pressures were then checked with a pressure gauge and recorded for later use in permeability calculations.

Each zone was tested for a period of five minutes, and the amount of water received by the zone was recorded with the use of a standard water meter. Nine zones representative of the major hydrogeologic units of interest were tested in each drill hole using this technique.

3. Findings

Operating pressure and water volumes were used to calculate the permeabilities for each of the zones tested. Adjustments were made for pipe loss where necessary. Raw data and calculations can be found in Appendix D. Table II-1 shows the permeability measured for each zone tested.

4. Conclusions

As expected, higher permeabilities were found in the sandstone units. Shale zones separating these units, however, were measured to have a permeability of essentially zero, indicating very low to no potential for vertical migration of contaminants to underlying aquifers.

H. Pumping Test of Well CPW-1

1. Purpose

In order to determine whether the void at location CPW-1 might serve as a pathway for contaminant migration Hart conducted a large capacity pumping test to effect a water level drawdown to evaluate the volume of the void.

TABLE II-1

PERMEABILITY TEST RESULTS

Test Zone Depth Elev. (in ft.)(MSL)	Hole DMW#	K Cm/sec	Lithology	Formation
1249-1254	3	1.74×10^{-5}	Sandstone	Homewood
1235-1240	2	LT 10^{-8}	Sandy Shale	Homewood
1209-1210	3	1.86×10^{-4}	Sandstone	Homewood
1205-1210	2	2.68×10^{-5}	Sandstone	Homewood
1179-1184	3	1.71×10^{-3}	Sandstone	Homewood
1175-1184	2	LT 10^{-8}	Shale	Mercer
1154-1159	3	GT 2.07×10^{-3}	Sandstone	Upper Connoquennessing
1150-1155	2	8.84×10^{-5}	Sandstone	Upper Connoquennessing
1144-1149	3	GT 1.65×10^{-3}	Sandstone	Upper Connoquennessing
1140-1145	3	LT 10^{-8}	Shale	Middle Connoquennessing
1115-1120	2	2.71×10^{-5}	Sandstone	Lower Connoquennessing
1104-1109	3	4.88×10^{-5}	Sandstone	Lower Connoquennessing
1089-1104	3	2.90×10^{-4}	Sndstone	Lower Connoquennessing
1185-1090	2	LT 10^{-8}	Shale	Burgoon Shale Unit
1059-1064	3	3.02×10^{-4}	Sandstone	Burgoon
1050-1055	2	GT 5.18×10^{-4}	Sandstone	Burgoon
1039-1044	3	LT 10^{-8}	Sandstone	Burgoon
1025-1030	2	9.45×10^{-5}	Sandstone	Burgoon

LT Less Than
GT Greater Than

2. Methods

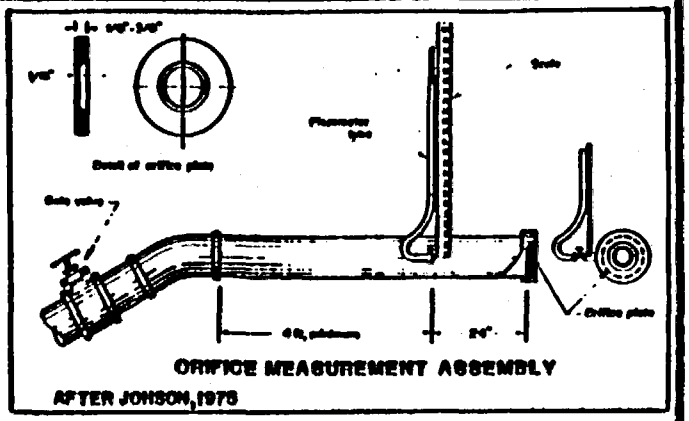
Lininger Drilling and Pumps set a large capacity submersible pump into well CPW-1. Pump discharge was measured continuously with an orifice measurement device constructed by Lininger. The pump test was conducted for a period of three hours. Water levels in well CMW-1 and the small pond were measured and recorded throughout the test to monitor the drawdown in the formation voids or possible hydraulically connected areas.

3. Findings

Figure II-9 shows the orifice method of measurement and the calculation of pumping rate (after Johnson, 1973). Figure II-9 also shows the pumping rate as a function of time and reports the total volume of water removed during the pumping test. Although approximately 50,000 gallons of water was pumped out over a period of three hours, no significant drawdown was noticed in either the pond or the CMW-1 well. A noticable drawdown would have been effected for the reported range of permeabilities of the formation if the water was removed from the intersticial pore spaces or bedding planes fractures, within the formation.

4. Conclusions

The lack of a noticeable water level drawdown indicates the possibility that water was entering the well from a rather extensive void area. The difference between water levels in the fill and the void area, however, indicate that although the disposal area and the void may be in hydraulic connection, flow may be restricted through this boundary. In addition, the lack of water level drawdown in the Homewood formation at that location during the test also indicated the lack of a significant hydraulic connection in this instance as well.



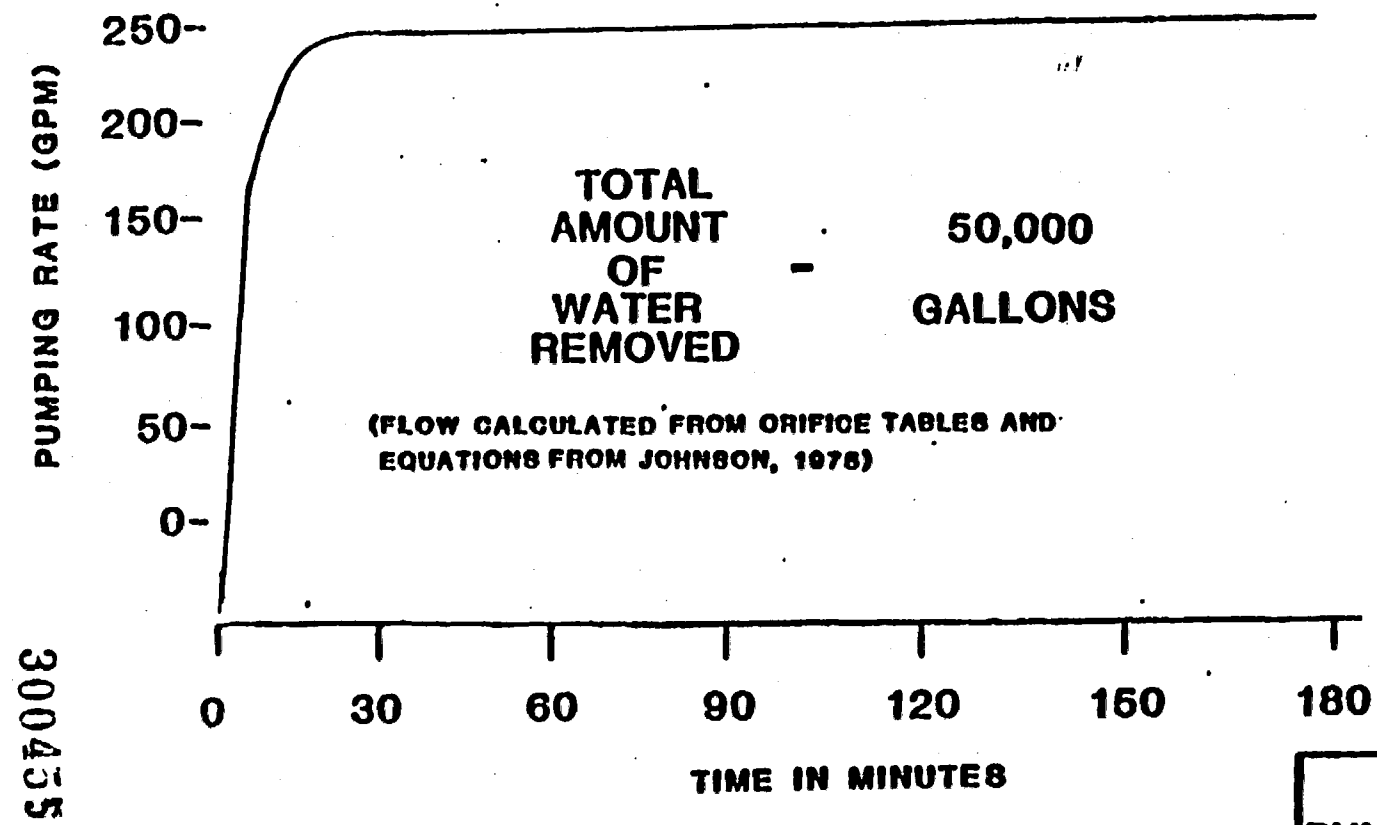


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FIGURE II-9
PUMP TEST MEASUREMENT
OSBORNE SITE
FRED C. HART ASSOCIATES, INC.

I. Monitoring Well Installation

1. Purpose

Hart installed 18 monitoring wells and one large capacity pumping well at the locations shown in Figure II-7 in order to monitor the different aquifers for chemical and hydrogeologic parameters.

2. Methods

Hart directed Lininger to install several types of wells at various depths based on geologic data and the results of the OVA analyses. For example, two-inch PVC monitoring wells were installed in each of the three NX cored bedrock holes (DMW-1, MWW-1 and CMW-1). Four-inch PVC was used in the installation of the SW and LW series wells. The SW-series wells were screened in glacial overburden or mine spoil water bearing zones. Two of the four LW series wells were screened in zones reflecting actual leachate conditions. Only the top few feet at locations LW-2 and LW-4 consisted of disposal material, since the limits of the disposal site did not extend as far as was thought. LW-2 and LW-4 were screened in mine spoil material.

A Bucyrus-Erie 22-W Cable tool drilling rig was utilized to drill the UMW series wells, as well as wells DMW-2, DMW-3 and CPW-1. These five UMW series wells were constructed of welded steel casing driven into the bedrock surface to prevent leakage from higher water bearing zones. These holes were finished as open holes in the Homewood Sandstone bedrock aquifer.

Wells DMW-2 and DMW-3 were drilled into the Burgoon sandstone as 6 inch open holes. A 4" PVC screen and casing was inserted following geophysical logging and aquifer permeability testing.

As noted, one well (CPW-1) was finished in the Clarion formation for the purpose of performing a pump test to examine of the potential extent of void areas encountered during previous drilling.

In addition, wells MMW-1, DMW-2, and UMW-2, which were installed through possible mine void zones, were double cased to prevent water from the mine voids from entering lower zones.

During the latter stages of the field Investigation, spring meltwaters and heavy rains caused flooding in several areas of the site. The worst flooding occurred in the area of wells DMW-1, SW-4, UMW-5. Water was within 4 inches of the top of the wells at this location. These well casings were extended approximately two feet to insure that floodwaters did not enter the wells. The land surface immediately surrounding these wells was raised accordingly to prevent excess standing water.

3. Findings

Appendix E presents well construction diagrams for all the wells at the Osborne Site. All major water bearing zones of consequence were included in the Osborne groundwater monitoring system.

The water table aquifer at the site, which could act as a surficial groundwater pathway, is monitored by the LW and SW series wells. Wells LW-1 and 3 are screened in landfill material. Wells LW-2 and 4 are screened in mine spoils. Wells SW-3 and 4 are also screened in mine spoils. Well SW-2 appears to be screened in glacial valley till material. Well SW-1 is screened in the glacial deposits overlying the cornfield. Well CMW-1 monitors the Clarion formation and the possible void zone. Wells UMW-1 through 5 monitor the Homewood formation. One well, MMW-1, monitors the Upper Connoquennessing formation for groundwater quality. Because very little of the Upper or Lower Connoquennessing groundwater is used, no other wells were installed in this formation. Wells DMW-1 through DMW-3 monitor the Burgoon formation, a major source of groundwater supply in the area.

4. Conclusions

All well construction, installation and development procedures were conducted in accordance with the Consent Order and Agreement Work Plan. DER approved well designs and locations prior to any drilling activities at the

site. DER approved all completed wells following their installation. Each well is currently functioning as its design indicated, except for well SW-1. Due to the nature of the deposits at location SW-1, well SW-1 had to be set in low permeability glacial materials. These materials prevent adequate recharge of the well. Sampling and analyses of these wells are discussed later in this report.

J. Survey Work

1. Purpose

Hart surveyed well casing elevations and spatial locations in order to determine groundwater flow characteristics at the site. Hart also performed a detailed topographic survey of the site for use in surface drainage mapping and engineering calculations of disposed materials.

2. Methods

Hart performed an elevation survey at the site using an automatic level. Distances were measured by a stadia and were checked with a measuring tape. Relative elevations were accurate to ± 0.01 feet. A permanent benchmark at the site was located at the base of the stationary terminal fence post at entry gate to the site. This benchmark was tied to a USGS Benchmark located from the Grove City quadrangle map at the corner of Diamond and Enterprise roads, accurate to ± 0.5 feet absolute elevation.

Prior to the remedial investigation, Hart directed Norman Straub, P.E., L.S., of Grove City in the performance of the emplacement of an initial grid system over the surface of the site. The work was performed with and tied into a property boundary survey conducted as part of the Site Security Program. Well casing elevations and locations, as well as both a map made by Straub in 1973 and Hart's 1983 map, were all referenced to the same grid to which all other site activities were also referenced. A new topographic map was prepared which more accurately reflects the landfilled surface at the time of this investigation.

Hart also performed a monitor well casing elevation survey following the completion of the wells. Wells DMW-1, SW-4, and UMW-5 required re-surveying following the casing extension program previously discussed.

3. Findings

Well casing elevations are reported later in this chapter in the section on sampling. Straub's 1973 topographic map, as referenced to the site grid, is included as Figure II-10. Hart's 1983 topographic map is included as Figure II-11. Further analyses of these maps may be found in Chapter III, Waste Types and Quantities.

4. Conclusions

All on-site activities were referenced to the grid on-site. In addition, the reference grid was also tied into a property boundary survey. Hart tied elevations (± 0.01ft) on the site to a USGS benchmark (± 0.5 feet above mean sea level) located at intersection of Diamond and Enterprise Roads. A new topographic map of the site was constructed. The site appears to have accepted a layer about ten feet thick of disposed material between 1973 and 1978 in the central part of the disposal area. Well casing elevations and locations were used to determine groundwater surface elevation and calculate flow direction and gradient, presented later in this report.

K. Sampling

1. Purpose

The purpose of the sampling program at the Osborne site was to assess the quality of the groundwater, surface water, and leachate. Hart collected samples at the site on three separate occasions: December 5th through 9th, 1983; January 18th through 20th, 1984; and April 2nd through April 4th, 1984.

On the first sampling trip, Hart collected six surface water samples at the locations shown in Figure II-12 and twelve groundwater samples from the groundwater monitoring wells shown in Figure II-7. In addition, Hart col-

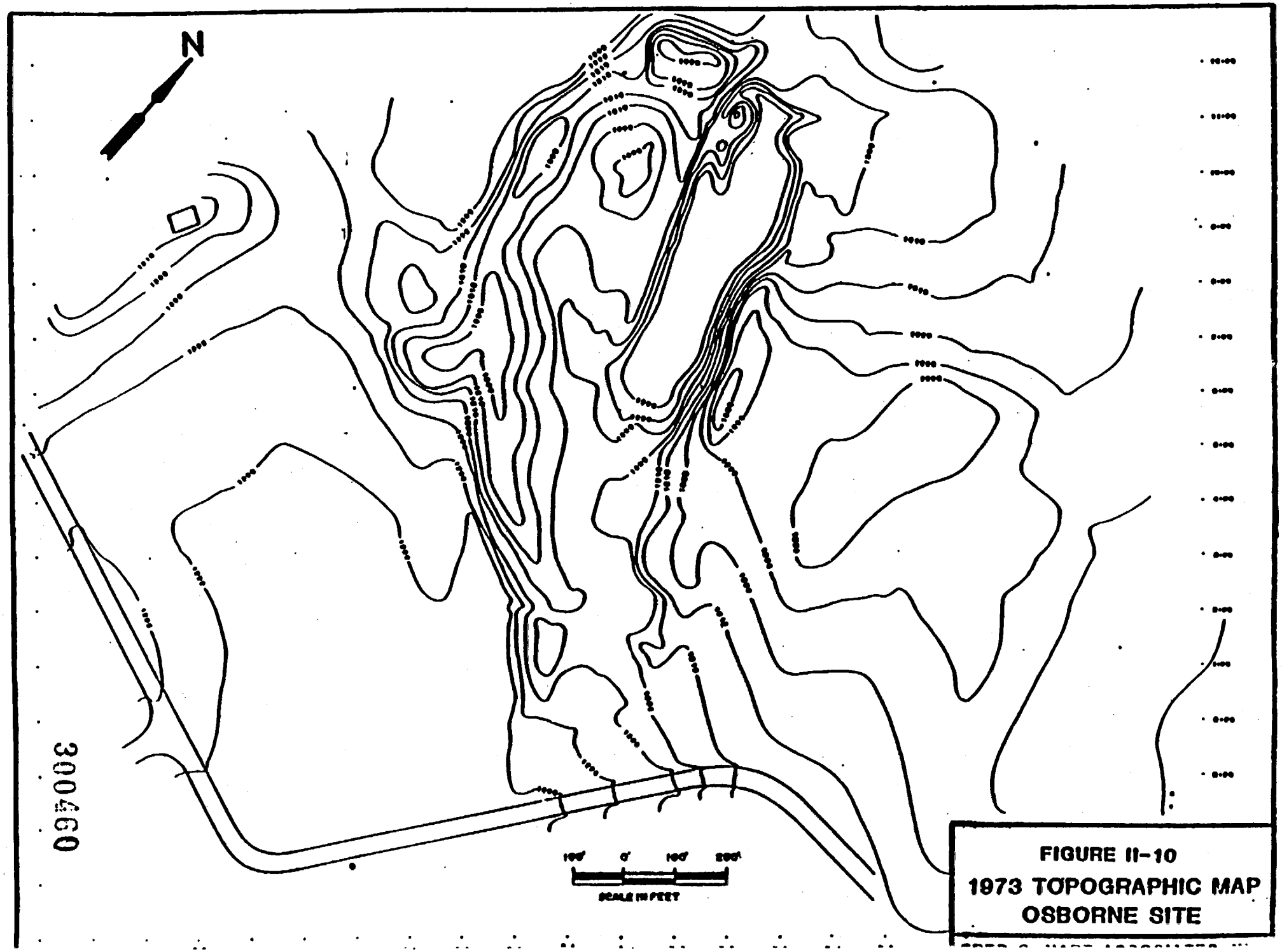


FIGURE II-10
1973 TOPOGRAPHIC MAP
OSBORNE SITE

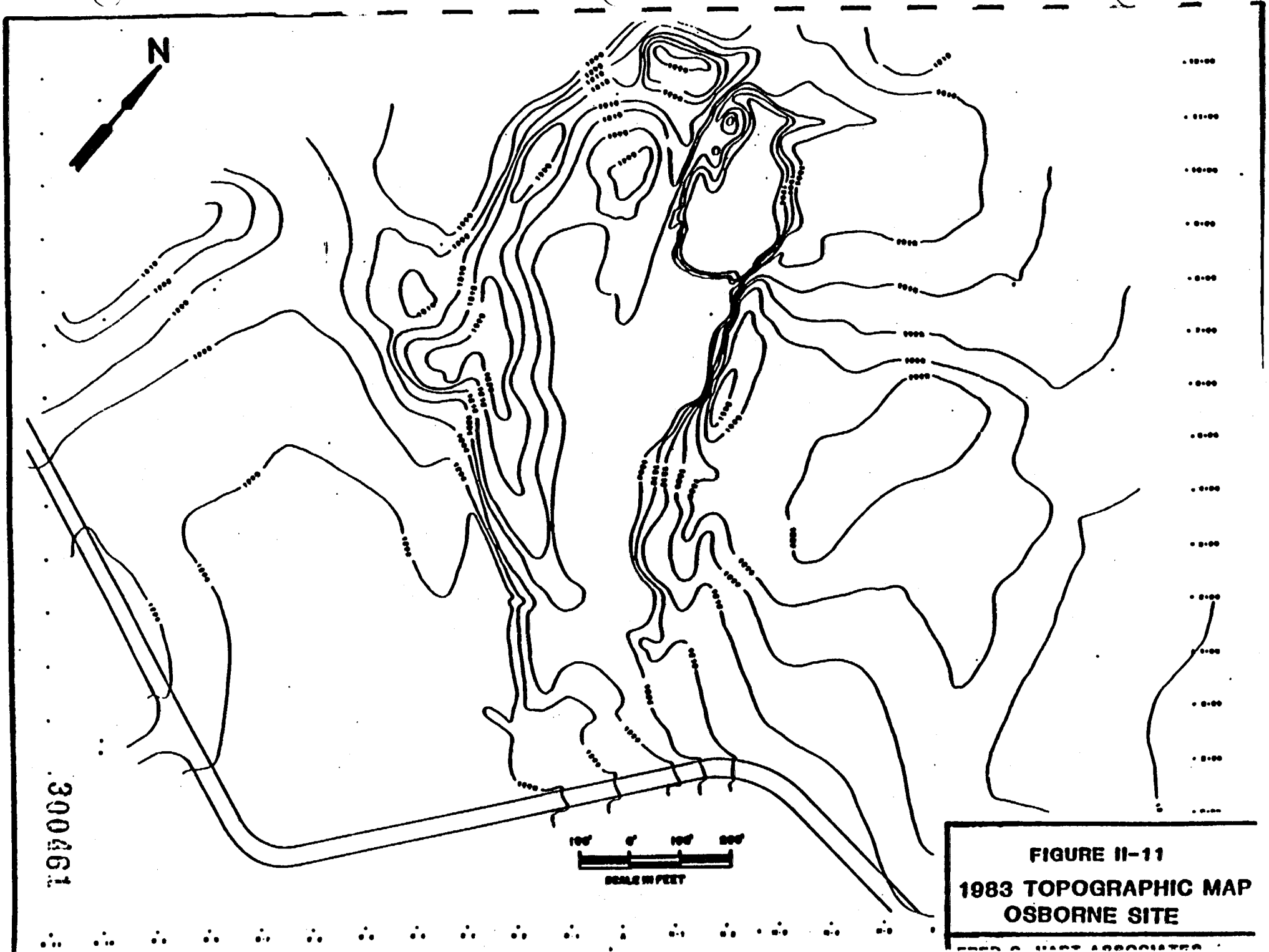


FIGURE II-11

1983 TOPOGRAPHIC MAP
OSBORNE SITE

lected four seperate leachate samples (for volatile organic analysis only) and one composite leachate sample from the four leachate wells (LW1 through LW4 as shown on Figure II-7).

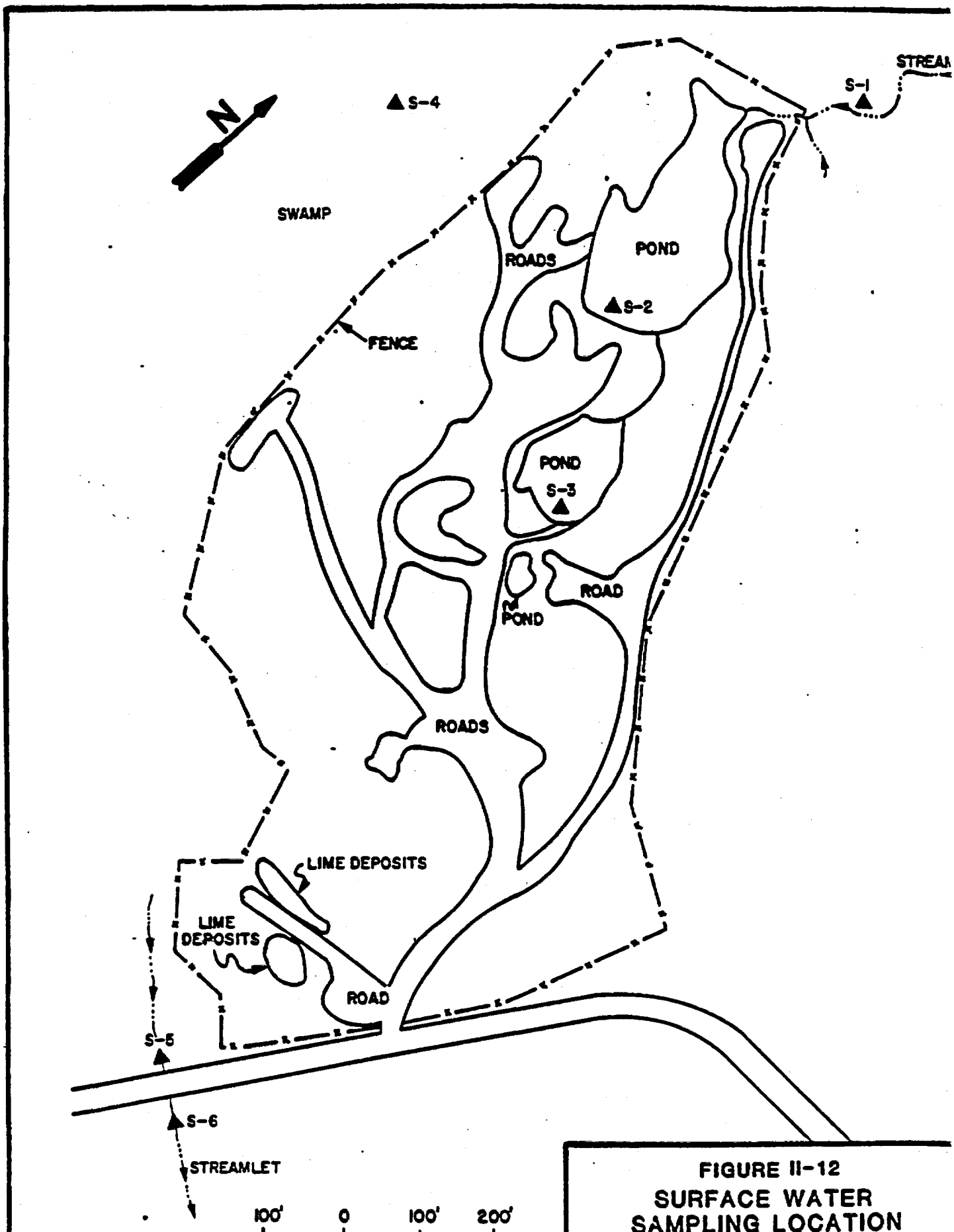
On the second sampling trip, nine groundwater samples were collected: five from the uppermost aquifer monitoring wells (UMW1 through UMW5), one from the middle aquifer monitoring well (MMW-1), two from the deep aquifer monitoring well (DMW-1) (one sample was filtered and analyzed for metals only) and one from the Clarion formation monitoring well (CMW-1).

On the third sampling trip, three groundwater samples were collected from the deep aquifer monitoring wells (DMW-1 through DMW-3).

2. Methods

Before sampling the groundwater and leachate wells, water level measurements were taken with a steel tape to a precision of ± 0.01 foot and recorded for the determination of hydraulic gradients and groundwater flow directions. Water level measurements are presented in Table II-2. Except as noted, a minimum of three well volumes was then evacuated to insure a representative sample. The amount of water evacuated from each well during sampling is presented in Table II-3.

Following well evacuation, a bailer was lowered into the well to collect the sample. On the first sampling trip, teflon coated copper bailers were used. The bailers were field washed with acetone and methylene chloride prior to use in each well. On the second and third sampling trips, bottom loading stainless steel bailers with teflon check valves were used. Methylene chloride was replaced by methanol due to the detection of methylene chloride in some of the the initial samples. A new piece of nylon cord at least 10 feet in length was also used to lower the bailer into the well. The first 3 bails of water were wasted from each well before retaining groundwater samples to assure that the bailers were thoroughly rinsed of cleaning agents prior to sample collection. Samples were then poured directly from the bailer into sample bottles and stored on ice in shuttles for delivery to the laboratory.



KEY:
▲S-1 - SURFACE WATER SAMPLING LOCATION

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FIGURE II-12
SURFACE WATER SAMPLING LOCATION
OSBORNE SITE

FRED C. HART ASSOCIATES, INC.

TABLE II-2
WATER LEVEL MEASUREMENTS
Water Surface Elevation (MSL') by Date

Well	Casing Elevation (MSL ft)	12/6-9/83	1/18/84	1/20/84	3/1/84	3/7/84	3/15/84
LW-1	1,302.81	1,294.32	1,295.18	1,295.00	1,297.88	1,297.56	1,297.06
LW-2	1,306.11	1,292.92	1,293.62	1,293.37	1,296.36	1,296.29	1,295.16
LW-3	1,304.90	1,291.05	1,291.83	1,291.64	1,294.45	1,294.01	1,293.34
LW-4	1,292.62	1,287.84	1,297.78	1,287.66	1,288.93	1,288.47	1,280.39
SW-1	1,328.71	1,300.06	1,301.14	1,301.16	1,301.37	1,301.43	1,301.48
SW-2	1,289.59	1,288.18	1,287.79	1,287.69	1,288.84	1,288.47	1,285.03
SW-3	1,322.10	1,290.66	1,289.65	1,289.55	1,290.54	1,291.00	1,289.52
SW-4*	1,300.70	1,295.15	1,294.96	1,294.78	1,297.58	1,297.22	1,296.54
UMW-1	1,307.10	1,280.47	1,280.46	1,280.34	1,280.82	1,280.77	1,279.02
UMW-2	1,328.45	1,281.75	1,281.89	1,281.67	1,282.22	1,282.00	1,279.25
UMW-3	1,293.70	1,278.28	1,278.39	1,278.24	1,278.84	1,277.17	1,261.74
UMW-4	1,322.39	1,280.48	1,280.52	1,280.41	1,281.18	1,280.90	1,277.21
UMW-5*	1,300.76	1,293.74	1,294.22	1,294.14	1,296.63	1,296.24	1,295.51
DMW-1*	1,301.12	1,250.48	1,250.24	1,250.19	1,250.24	1,250.34	1,255.15
MMW-1	1,329.24	1,265.44	1,255.61	1,255.59	1,256.06	1,257.11	1,259.15
CMW-1	1,328.84	1,284.35	1,294.02	1,284.67	1,285.19	1,285.50	1,285.19

* Due to potential flooding problems, casings on these wells were extended on 4/2/84. At that time, two deep (DMW series) wells were installed and surveyed. The new casing elevations are:

SW-4	1,303.51
UMW-5	1,303.68
DMW-1	1,303.84

The current casing elevations and water levels taken on 4/4/84 in the DMW wells are, respectively:

DMW-1	1,303.84	1,248.46
DMW-2	1,326.30	1,248.43
DMW-3	1,294.54	1,249.49

TABLE II-3

WELL EVACUATION DATA

Well	Volume Removed Prior to Sampling (gals) 12/83	1/84	4/84
LW-1	250	-	-
LW-2	20**	-	-
LW-3	80	-	-
LW-4	25*	-	-
SW-1	1.5*	-	-
SW-2	85	-	-
SW-3	164	-	-
SW-4	150	-	-
UMW-1	350	350	-
UMW-2	330	330	-
UMW-3	360	360	-
UMW-4	430	430	-
UMW-5	1680	1680	-
CMW-1	12	6.25	-
MMW-1	60	60	150
DMW-1	150	150	11,250
DMW-2	-	-	25,920
DMW-3	-	-	

Note:

A minimum of 3 well casing volumes of water were evacuated from the well to assure a representative sample of the formation except where noted.

* 1 volume only
** 2 volumes only

Chain-of-custody procedures were followed throughout the sampling program in accordance with standard EPA protocols as set forth in EPA Document #600/2-80-018. On the first sampling trip, the samples were shipped via Federal Express to Environmental Testing Corporation (ETC) for priority pollutant analysis. On the second and third sampling trips, the samples were hand-delivered to ETC.

3. Analytical Program

All of the samples collected were analyzed for priority pollutants by Environmental Testing and Certification (ETC) of Edison, New Jersey. ETC supplied all bottles, preservatives, ice packs, shipping containers, analysis request forms, and chain-of-custody forms in accordance with the standard EPA protocols set forth in EPA Document #60012-80-018.

After receiving the samples, ETC prepared and analyzed the samples for priority pollutants using EPA method Nos. 624, 625, and 200.1 through 200.98 as set forth in the Federal Register, 3 December 1979, pages 69532 and 65940, and "Methods for Chemical Analysis of Water and Waste," EPA Document #600/4-79-020, respectively.

4. Findings

For each sample, a report was provided with analytical results, methodology, quality control/quality assurance information and chain-of-custody forms. ETC has also provided a Data Management System Summary Report which lists, for each sample location and date, the compounds detected above the EPA method Detection Limit. This Report is provided in Appendix F. The reduced chemical data and a discussion are provided in the Surface Water and Groundwater Quality Sections (Chapters IV and V).

5. Conclusions

Compounds which were detected were present in the low parts per billion range. Low levels of volatile organic compounds were detected in some of the leachate and in some of the Homewood wells. Some low levels of organic

compounds were also detected in the Burgoon Formation. In general, the analytical data suggested that any contamination present at the site is present only in very low concentrations..

CHAPTER III

WASTE TYPES AND QUANTITIES

This chapter presents information on the types and quantities of wastes disposed at the Osborne Site. This information was developed from data and analysis obtained from aerial photos, on-site observations, the initial site characterization, the waste removal operation during the Site Security Program, test boring magnetometry data, OVA logs and leachate well chemical analysis. It is organized into four sections:

A. Waste Disposal History

B. Characterization of Surface Wastes

C. Characterization of Subsurface Wastes

D. Conclusion

A. Waste Disposal History

The site was operated as a disposal area by Mr. Sam Mooney from the 1950's until 1963. The operation continued under the ownership of Mr. James Osborne from 1963 until 1978. The site was closed by the DER in 1978.

Materials disposed over the life of the Osborne site included industrial waste, with lesser amounts of municipal refuse and allegedly hazardous wastes. All disposal activities were conducted within the 15 acre topographic valley created by past coal strip mining operations. The primary material disposed was foundry sand.

Hart inventoried, analyzed, and arranged for the removal and off-site disposal of drums and contaminated soil on the surface of the site as part of the Initial Remedial Measures. Data generated both from the Initial Remedial Measures and the subsequent Remedial Investigation contributed to the understanding of the waste types and quantities buried at the site.

Figure III-1 shows the current surface features at the site including the pond locations, and the extent of the spoils piles and the disposal area. The determination of spoils piles and disposal area boundaries was based on aerial photo interpretations and field observations during the remedial investigation activities. The foundry sand was apparently disposed from southeast to northwest into the strip mine area. Infilling of the pond eventually raised portions of the land above water. Infilling continued up to the locations of the ponds currently on-site.

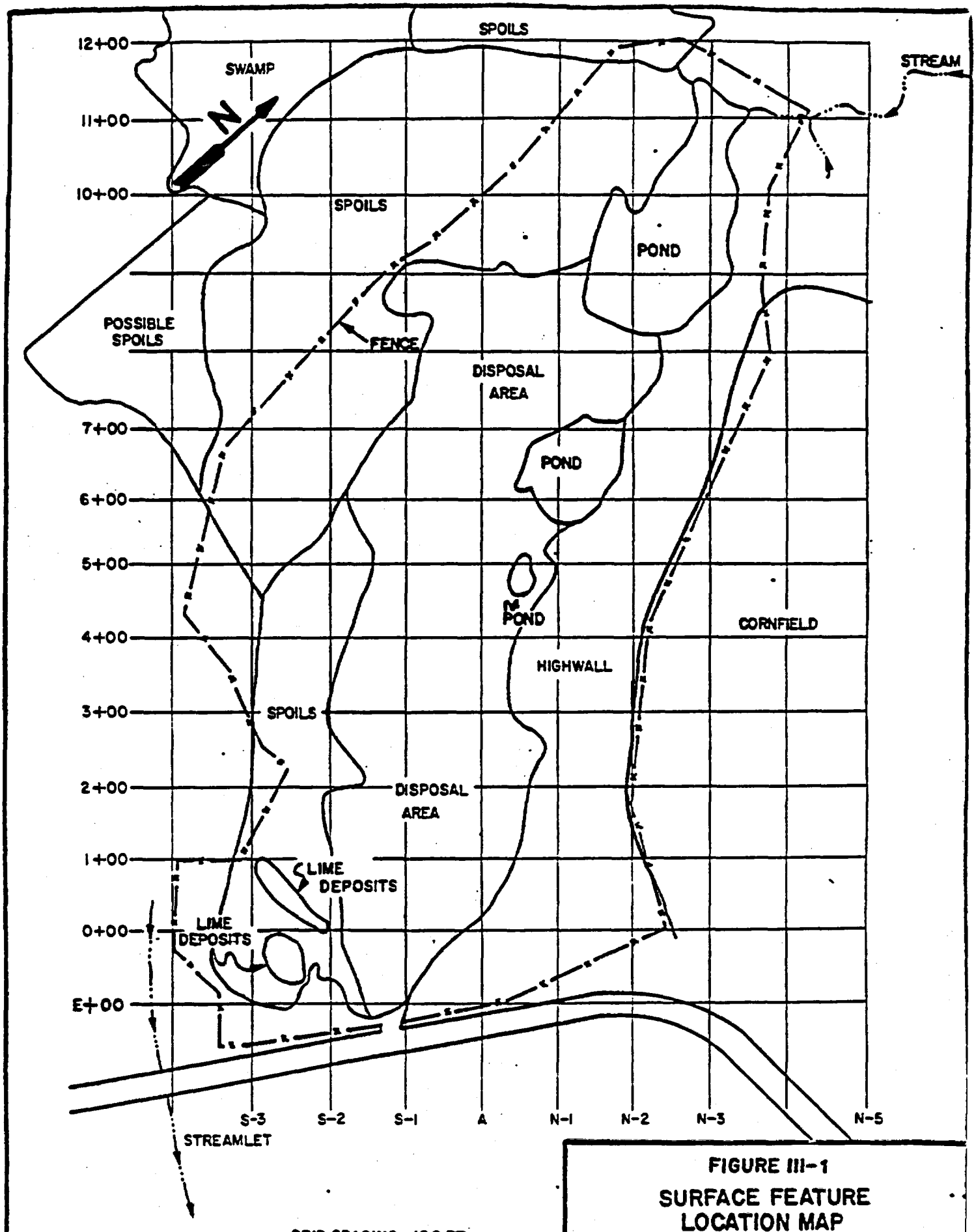
The clay underlying the Brookville coal became exposed upon the removal of the coal. The clay, which appears to be continuous under the site, forms the bottom of the disposal area.

B. Characterization of Surface Wastes

Extensive information on the surface wastes at the site was developed during the removal of all surface drums and contaminated soil as an Initial Remedial Measure.

As part of the IRM, Hart designed and carried out an inventory program to characterize the degree of hazard at the site and determine the waste types and quantities at the site. As a part of this effort, clusters of drums were located and designated as shown on Figure III-2. Four hundred and thirty-three drums, of which 74 were full and sealed, were originally identified. About 20% of the drums were selected for sampling based on drum location, accessibility, and condition. Each drum was assigned an ID number and inventoried for volume, apparent types of materials, and drum condition. Representative samples from the drums were collected for chemical analysis to provide prospective bidders with an indication of the types of waste to be disposed. Laboratory results are provided in Table III-1.

Associated Chemical and Environmental Services, Inc., (ACES) of Oregon, Ohio was selected as the surface waste removal contractor. The ACES team included Fondessy Enterprises, Inc., of Oregon, Ohio, as the disposal facility; Alert Laboratories, Inc., of Canton, Ohio, as the chemical laboratory; Delaware Container Company of Coatesville and Keystone Cement Company of



GRID SPACING = 100 FT.

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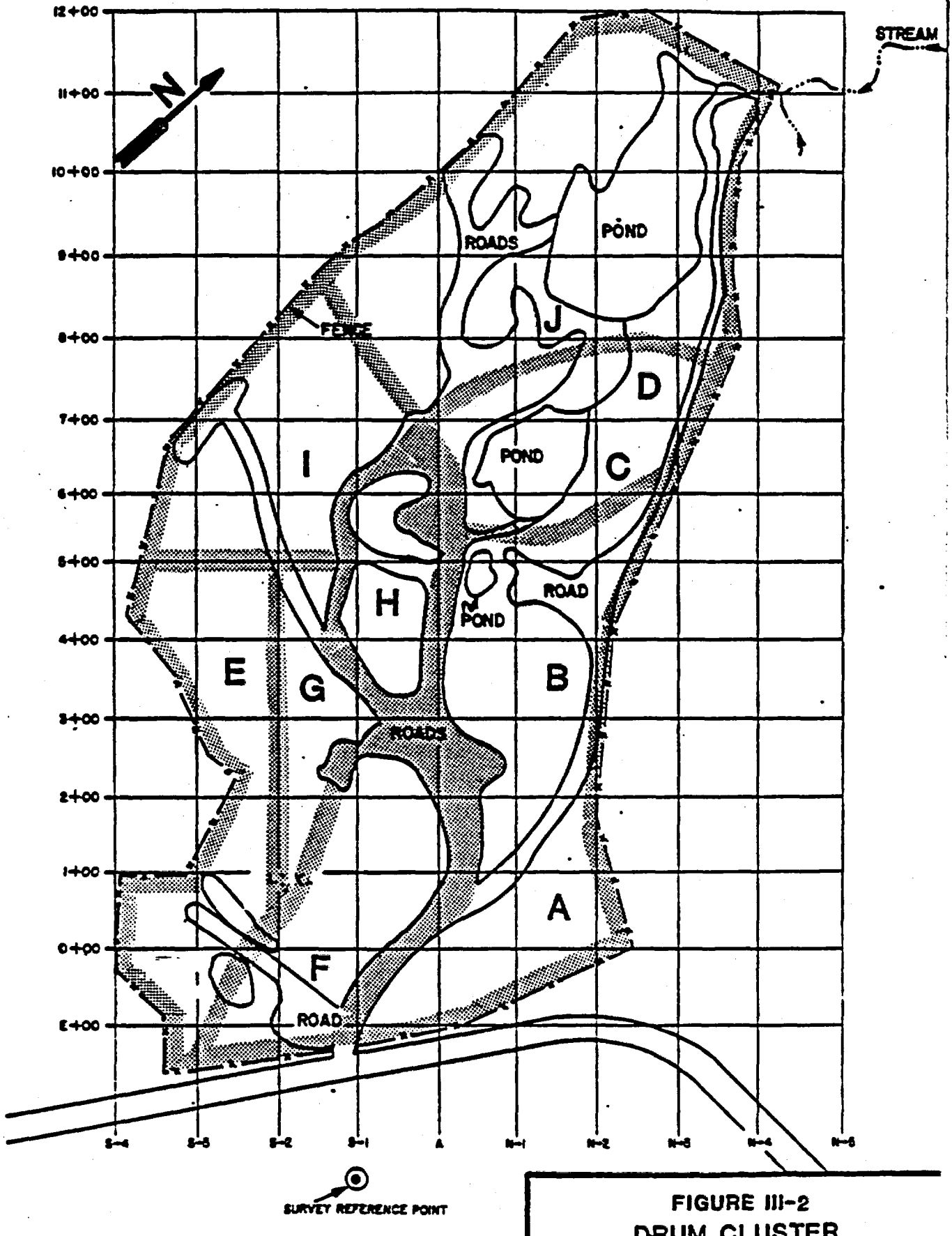
FIGURE III-1

SURFACE FEATURE LOCATION MAP

OSBORNE SITE

FRED C. HART ASSOCIATES, INC.



KEY:

DRUM CLUSTER BOUNDARY

GRID SPACING = 100 FT.

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FIGURE III-2

DRUM CLUSTER LOCATION MAP OSBORNE SITE

FRED C. HART ASSOCIATES, INC.

TABLE III-1 : CHEMICAL ANALYSIS OF SELECTED DRUMS AT THE OSBORNE SITE

PARAMETERS

DRUM NUMBER	Fuel Value (BTU/lb)	Ignitability (Flash Point in °C)	Corrosivity (pH)	PCB Aroclors 1242 mg/kg	1254 mg/kg	1260 mg/kg	RCRA METALS (EPA Hazardous Waste number/parameter) D004/ Arsenic mg/kg	D005/ Barium mg/kg	D006/ Cadmium mg/kg	D007/ Chromium mg/kg	D008/ Lead mg/kg	D009/ Mercury mg/kg	D010/ Selenium mg/kg	D011/ Silver mg/kg
B14	13741	**	6.5	lt10	lt10	lt10	lt0.2	7	lt0.8	0.4	30	lt0.09	lt0.1	0.9
I19	19892	49	9.5	lt10	lt10	lt10	lt0.2	lt0.2	lt0.8	lt0.2	20	lt0.07	lt0.1	lt0.2
J32	18232	**	3.0	lt250	lt10	lt10	lt0.2	lt0.2	lt0.8	2	lt2	lt0.08	lt0.1	lt0.2
D5	*	**	5.4	lt250	lt250	lt250	lt0.2	lt0.2	lt0.8	lt0.2	lt2	lt0.09	lt0.1	0.7
J45	19631	**	3.7	lt10	lt10	lt10	lt0.2	lt0.2	lt0.8	lt0.2	20	lt0.002	lt0.1	lt0.2
B53	13890	**	7.0	lt10	lt10	lt10	lt0.2	5	2.6	lt0.2	15	lt0.002	lt0.1	lt0.2
B4	19275	**	3.7	lt10	lt10	lt10	lt0.2	lt5	lt0.8	lt1	lt2	lt0.002	lt0.2	lt0.5
M22	19741	**	2.9	lt10	lt10	lt10	lt0.2	1	1.2	lt0.2	8.7	lt0.08	lt0.1	lt0.2
G36	17243	54	5.7	lt10	lt10	lt10	lt0.2	0.4	lt0.8	lt0.2	4.5	lt0.09	lt0.1	0.4
B91	19295	**	5.2	lt10	lt10	lt10	lt0.2	lt0.8	lt0.8	0.6	4.5	lt0.08	lt0.1	lt0.2
G50	*	35	13.8	lt10	lt10	lt10	lt0.2	0.9	lt0.8	lt0.4	lt4	lt0.1	lt0.1	lt0.4
G42	19453	**	3.7	lt10	lt10	lt10	lt0.2	lt0.2	lt0.8	lt0.2	lt2	lt0.08	lt0.1	lt0.2
F17	19449	**	5.7	lt10	lt10	lt10	lt0.2	lt5	lt0.8	lt1	lt2	lt0.002	lt0.2	lt0.5
A2	19101	**	2.7	lt10	lt10	lt10	lt0.2	lt5	lt0.8	lt1	2	lt0.002	lt0.2	lt0.5
G33	13429	**	8.2	lt10	lt10	lt10	lt0.2	7	0.9	0.2	lt2	lt0.008	lt0.1	0.9
I43	*	**	9.6	lt10	lt10	lt10	lt0.2	2	lt0.8	0.5	7.7	lt0.09	lt0.1	0.5
J1	—	**	5.4	lt1	lt1	lt1	lt0.5	lt5.0	lt0.8	lt1.0	lt2.0	0.004	lt0.5	lt0.2
AREA B SOIL	—		5.5	—	—	—	lt0.5	lt5.0	lt0.8	lt1.0	lt2.0	lt0.002	lt0.5	lt0.2
AREA G SOIL	—		6	—	—	—	lt0.5	lt5.0	lt0.8	lt1.0	6.0	0.003	lt0.5	lt0.2
G31 (SOLID)	—		5.6	—	—	—	lt0.5	lt5.0	lt0.8	lt1.0	lt2.0	0.002	lt0.5	lt0.2
RCRA ALERT LEVEL		<60°C	pH lt2 or pH gt12.5	—	—	—	5	100	1	5	5	0.2	1	5

— No Analysis
* Not Ignitable
** Flash Point Over 60°C
lt less than
gt greater than

Bath, Pennsylvania, as fuels blending facilities; Delaware Container as the treatment facility; and Delaware Container and NY-TREX, Inc., of Richfield, Ohio, as transporters.

Table III-2 provides a summary of the ACES drum inventory. Of the 603 drums restaged, 460 were empty. In addition, 45 cubic yards of contaminated soil was staged, removed, and disposed. A total of 83 drums were sampled. Data are summarized in Table III-3.

Drums were categorized into groups of organic liquids, organic liquids with high halogen content, sludges, aqueous liquids, drummed solids, and soil solids. A composite of all samples in each group was made by mixing an equal aliquot of each sample. These composites were each analyzed for EPA's Priority Pollutant List. A summary of the data is provided in Table III-4.

The composite samples from the 83 drums which were full and sealed identified 2 organic and 8 inorganic priority pollutants out of the total of 129. The maximum concentration of any organic priority pollutant in these filled and sealed drums was 0.5 percent. The concentration of inorganic priority pollutants was in the low parts-per-million with the exception of one measurement of 4,400 ppm of lead in one sample.

C. Characterization of Subsurface Wastes

The horizontal extent of the disposal area was determined utilizing aerial photos and topographic maps, evaluating locations of the spoils piles and strip mine walls and by making suitable assumptions for the side slopes. Cross-sections were developed from test boring data. Cross-sectional areas were calculated with the use of a planimeter. These cross-sectional areas were used to calculate the volume of the disposal area using the standard engineering method of "End Averaging." The estimated volume of the disposal area is approximately 233,000 cu. yds. A complete explanation of the methodology used in these volume calculations may be found in Appendix G.

Test borings within the area of waste disposal at the site were subsequently used to indicate the types and depths of buried waste at the site.

TABLE III-2

Summary of ACES Drum Inventory

Cluster	Drum Count
A	48
B	102
C	126
D	12
E	14
F	33
G	55
H	49
I	50
J	114
SITE TOTAL	603

Drum Breakdown by Contents

Liquids	83
Solids	60
Empty	460

Test borings indicated that foundry sand is the major component of the disposed material. Traces of wood waste were also found. No drums were encountered during test boring operations.

Magnetometry was unable to determine if magnetic anomalies were actually drums or other metallic materials.

The field screening of test boring samples with the OVA suggests that there is relatively little subsurface organic contamination, particularly above the water table. The major organic component identified by the OVA appeared to be methane.

The leachate wells identified a limited number of priority pollutants at low and isolated concentrations. Generally low concentrations of benzene (109 ug/1), nickel (87 ug/1) and chromium (60 ug/1) were detected. Lead (260 ug/1), mercury (4.2 ug/1) and arsenic (33 ug/1) were also detected. However, PADER's filtered samples showed lead levels at less than 10 ug/1, mercury levels at less than 1 ug/1, and arsenic levels at less than 10 ug/1. These differences in concentration levels suggest that most of the lead, mercury, and arsenic in the leachate is due to suspended solids. Metals tend to adsorb onto suspended solids, and therefore do not travel in groundwater as readily as they would if in solution.

D. Conclusion

Data developed during the course of the remedial investigation suggest that there are at present limited and isolated sources of low level contamination at the Osborne site. The major points are that:

- Most of the waste by volume is foundry sand.
- Filled and empty drums and contaminated soil once occupying the surface of the site have been removed.
- Chemical analysis of the wastes present in the full and sealed drums showed low concentrations of a limited number of priority pollutants.

- Chemical analysis of the leachate wells identified a limited number of priority pollutants at low concentrations.
- The OVA field screening of test boring samples within the limits of the disposal area indicated very little contamination above the water table.
- The OVA indicated low levels of organics in the leachate. Subsequent laboratory analyses of the leachate showed that most were non-priority pollutant compounds, although low concentrations of a limited number of priority pollutants were detected.

CHAPTER IV

SURFACE WATER

This chapter describes the regional drainage patterns and the specific drainage pattern at the Osborne disposal site. A description of the potential surface water pathways which might lead to contaminant migration is presented, and the potential surface water users are identified. Surface water quality data based on the sampling conducted by DER, EPA and Hart are tabulated. A brief discussion on the type and levels of organic and inorganic contamination detected at the site is also presented.

A. Regional Drainage Patterns

The Osborne site is located in the Wolf Creek watershed of the Beaver River Basin. Figure IV-1 shows the location of the site on a map of designated watersheds in the area. No formal studies or plans have been produced for the area of the site, and state mandated stormwater management planning has not yet been implemented in the Grove City Area (MCRCP, 1983).

Figure IV-2 shows an area drainage map prepared from the topographic map of the Grove City Quadrangle (USGS, 1943). This map indicates that surface runoff in the region will eventually drain into Wolf Creek. The topographical high area on which the site lies is known as a "hydrologic island," a concept treated by Poth (1963) in his description of the geology and hydrogeology of the area. The topographic lows which drain this hydrologic island are fed by runoff and also by components of groundwater discharge.

Figure IV-3 illustrates the site soils relationships and the concept of the hydrologic island as it relates to soils. The soils in the area of the site consist generally of gravelly or silty loams of the Chenango or Braceville Series. These soils are well-drained to very poorly drained, gently sloping to moderately steep, are underlain by sandy and gravelly deposits, and can be found on moraines and stream terraces near the Osborne site.

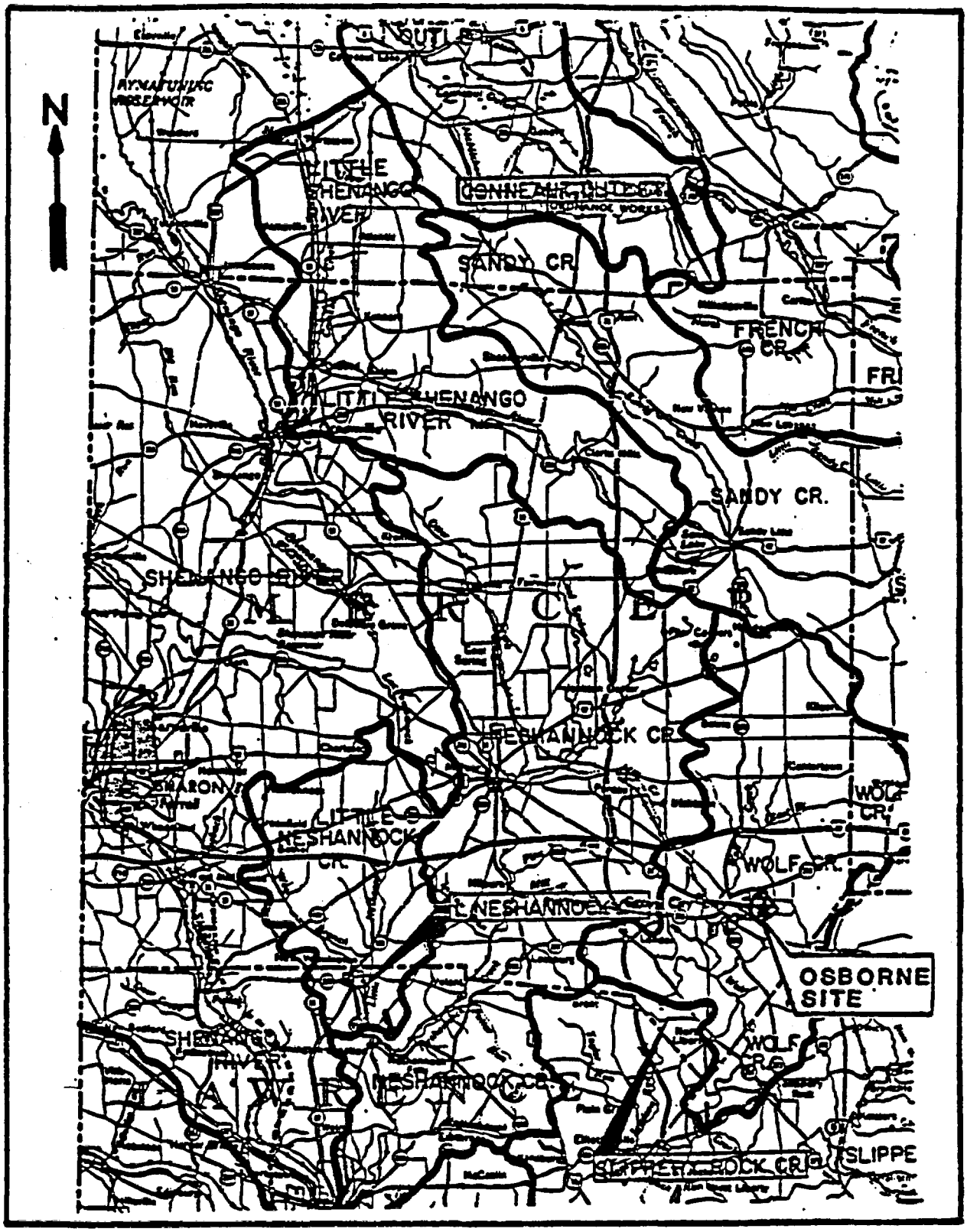

FIGURE IV-1
DESIGNATED WATERSHEDS IN THE GROVE CITY AREA OSBORNE SITE

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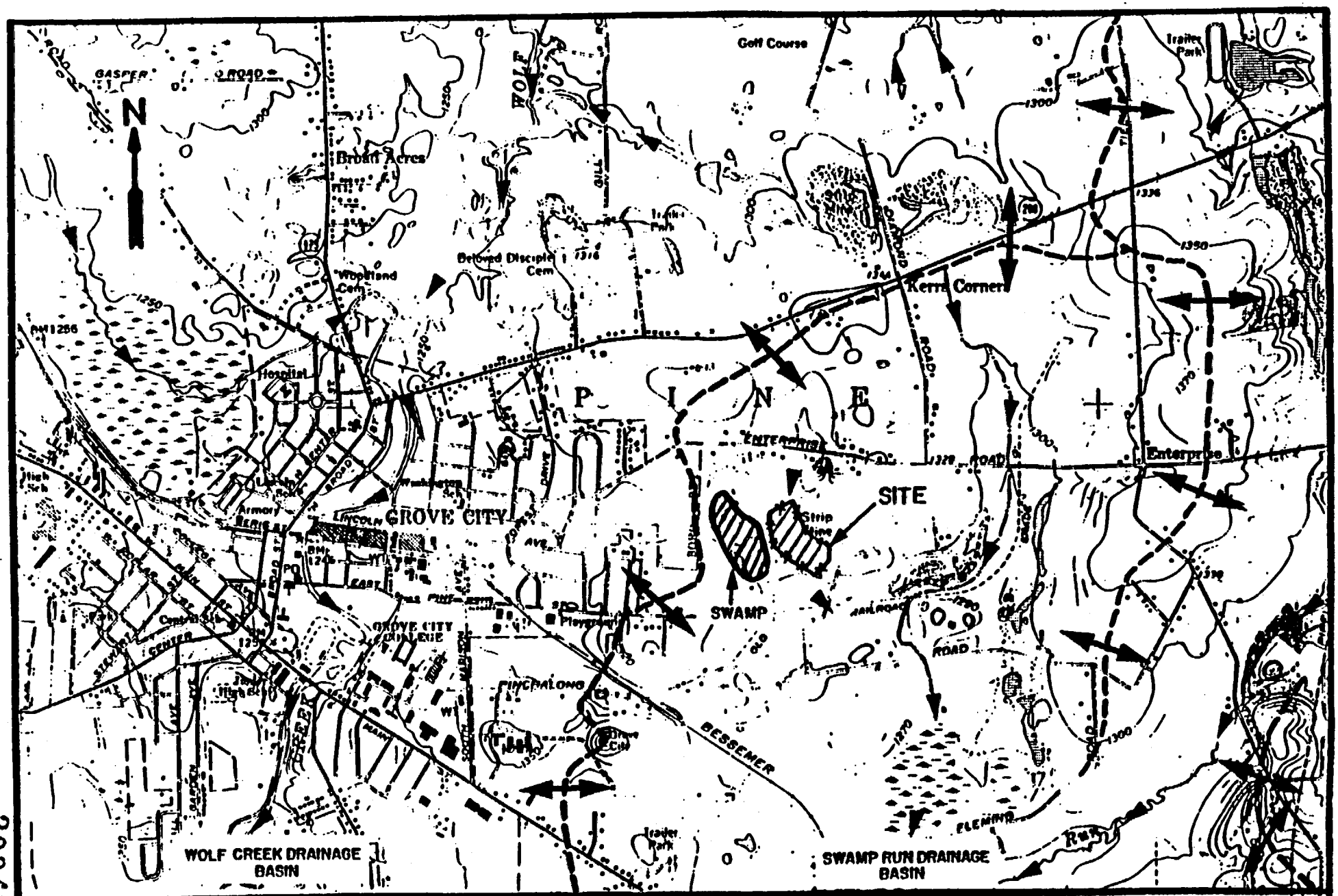

FIGURE IV-2
REGIONAL DRAINAGE MAP
OSBORNE SITE

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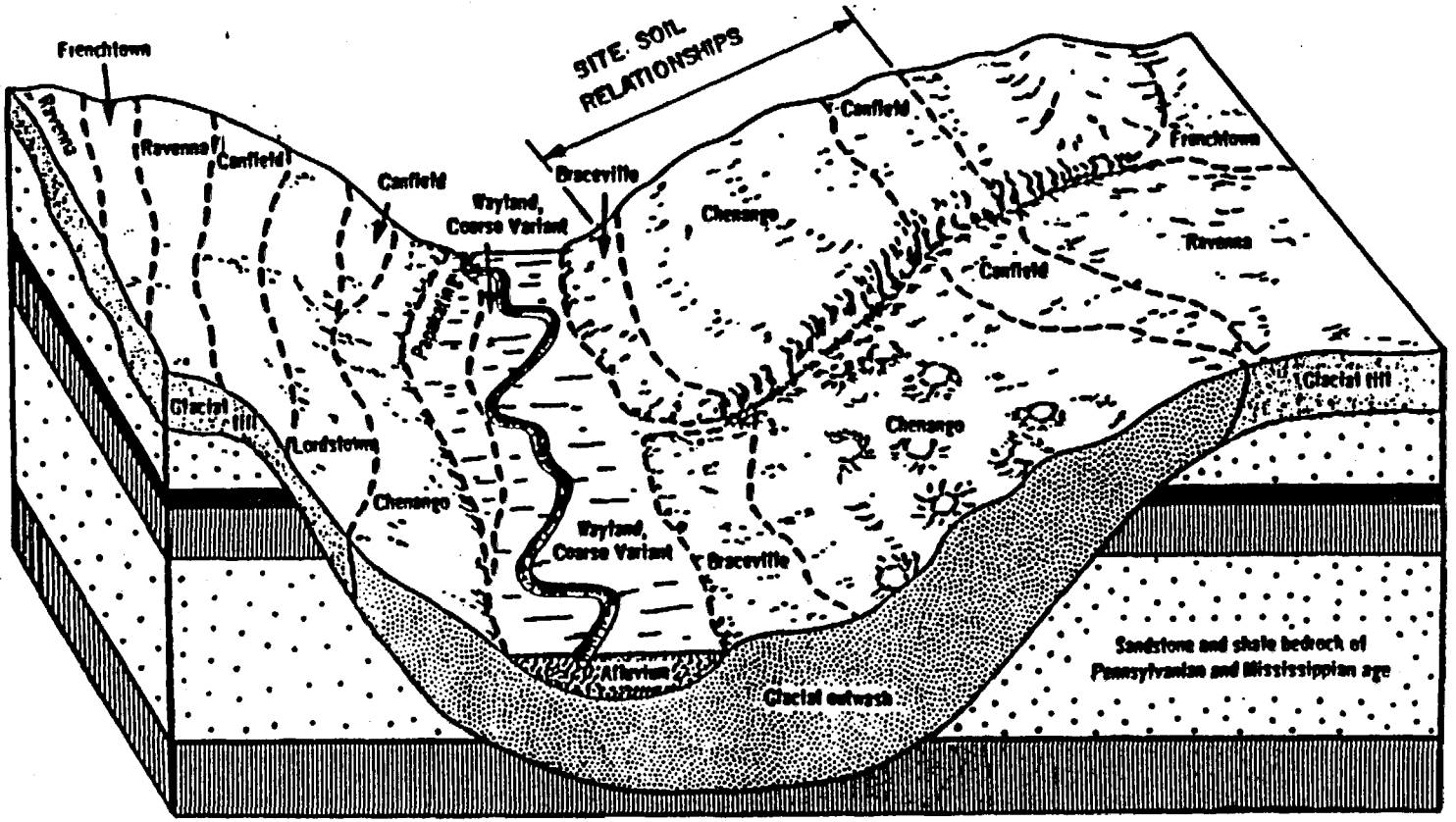

MODIFIED AFTER SOIL SURVEY OF MERCER COUNTY (USDA, 1971)

FIGURE IV-3

SOIL RELATIONSHIPS

OSBORNE SITE

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Runoff into these streams flows to the north into the unnamed creek or south into Swamp Run, both ultimately draining into Wolf Creek. Some smaller component of runoff flows west, directly into Wolf Creek, which flows to the south past Grove City.

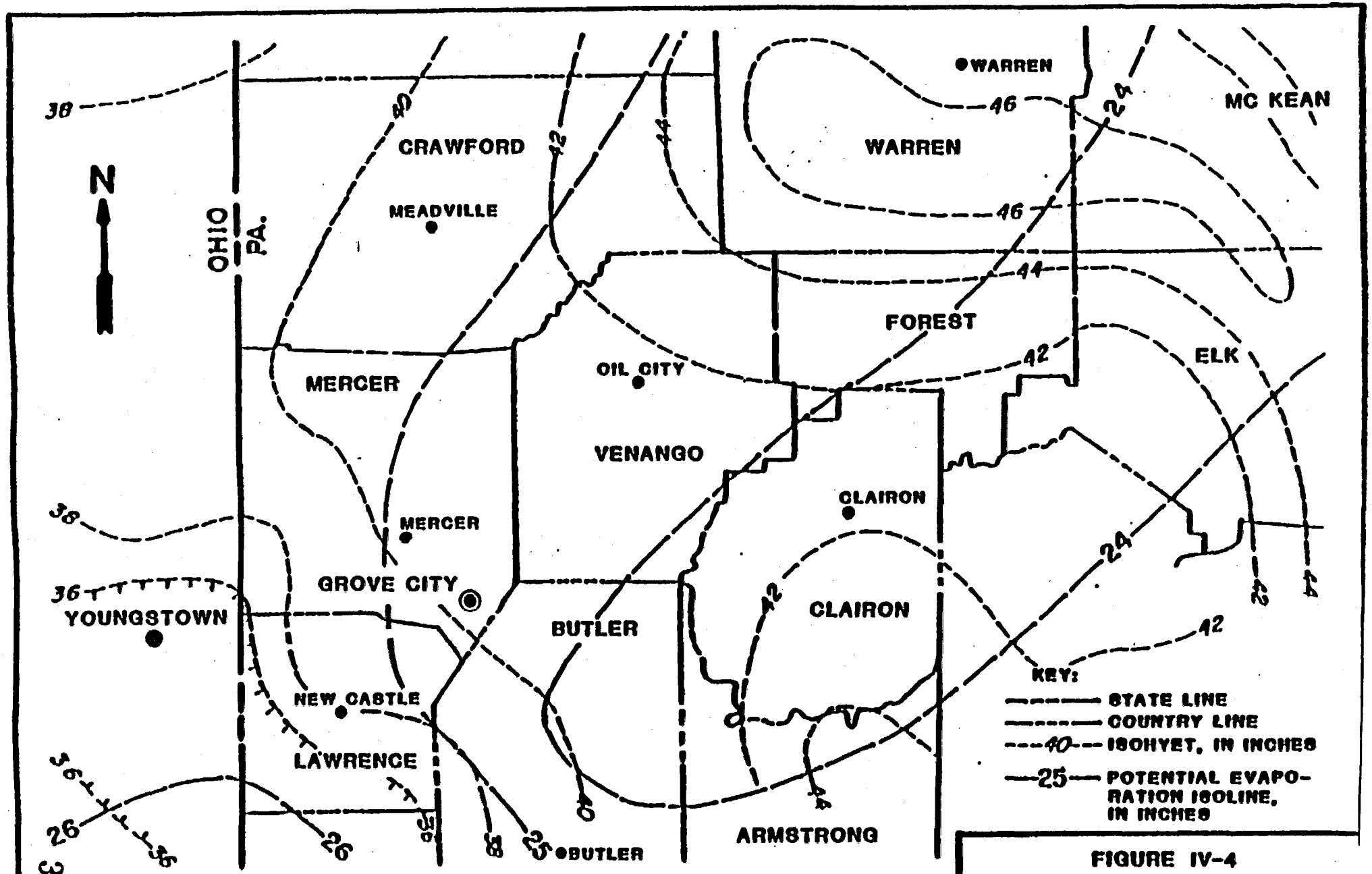
Figure IV-4 shows annual rainfall and evapotranspiration in northwestern Pennsylvania. The map indicates an annual rainfall of approximately 40.2 inches for the Osborne site. Annual evapotranspiration at that location is approximately 24.5 inches, leaving approximately 15.7 inches available for infiltration and runoff.

B. Site Drainage

Hart prepared a topographic map of the site (Appendix F). From this map, Hart prepared the site drainage map presented in Figure IV-5.

The present drainage patterns of the site are different than the natural drainage conditions. They have been altered due to the strip mining operations at the site. Figure IV-6 shows the evolution of the natural drainage conditions into the existing drainage patterns on the site. Interpretation of stereographic aerial photographs indicates that the creek flowing into the pond from the north was probably flowing through the area of the present day spoils piles. The stream was displaced due to the replacement of excavated mine spoils in or adjacent to the stream bed. As a result, an artificial drainage divide was created across the stream bed resulting in the swamp area to the west of the site. Continued alteration of the terrain deflected the runoff from the stream into the pond on the site.

The area covered by the pond was excavated to a depth of approximately 30 to 35 feet below the present water levels while the mine was still in operation. The pond, fed by surface water runoff from the area north and northwest of the site and most of the property on-site, has no apparent outlet. Since the pond water has no apparent outlet and is in direct hydraulic connection with the water in the fill area, the entire disposal area of the site acts as a reservoir for collected surface water. Water levels in the pond and disposal area fluctuate due to seasonal runoff. For this reason, water levels tend to be higher in the spring and summer months.



SOURCE: PA DER WATER BULLETIN NO. 13

FIGURE IV-4
ANNUAL RAINFALL AND EVAPOTRANSPIRATION IN NORTHWESTERN PA.

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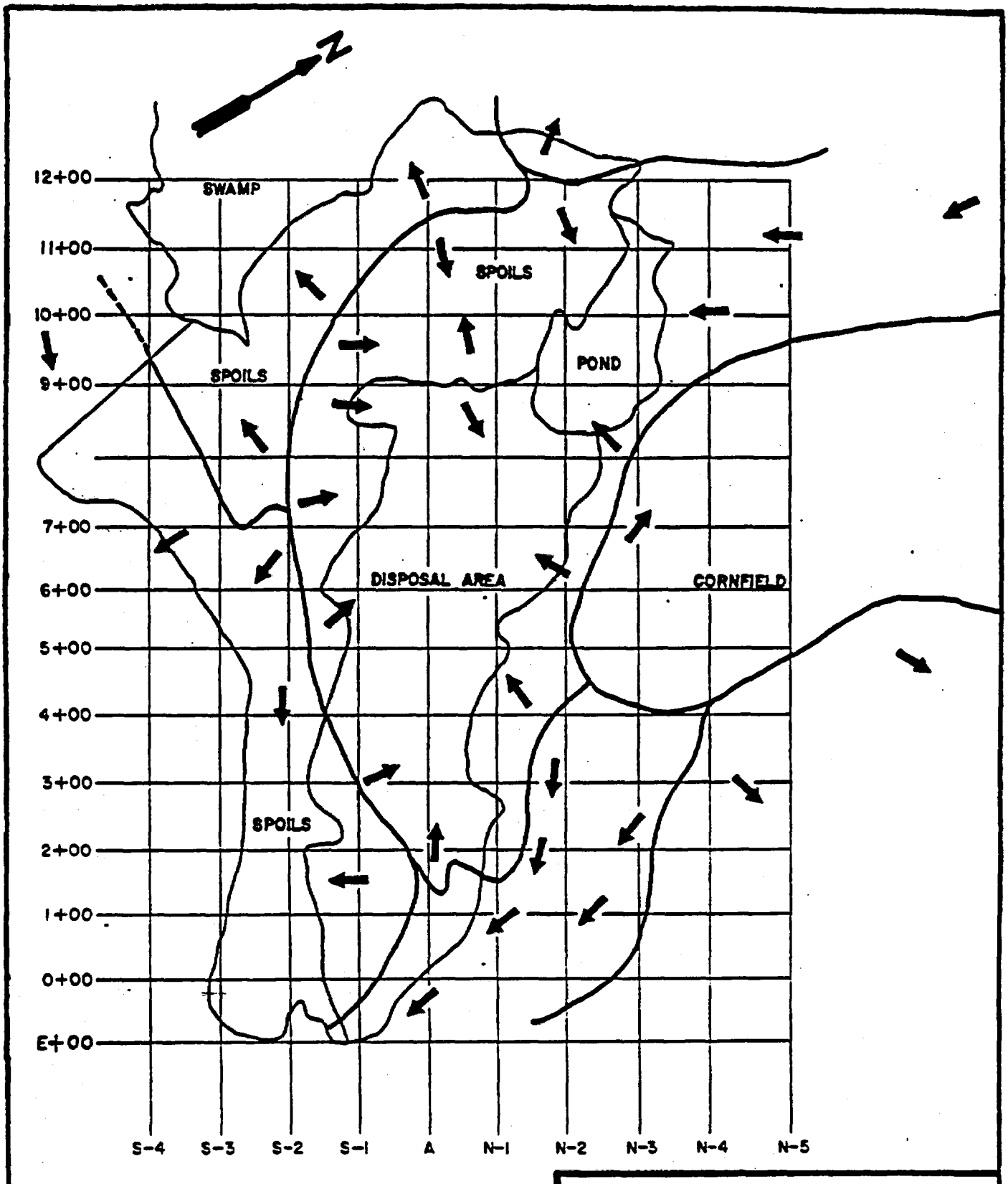

GRID SPACING = 100 FT.

FIGURE IV-5

DRAINAGE MAP

OSBORNE SITE

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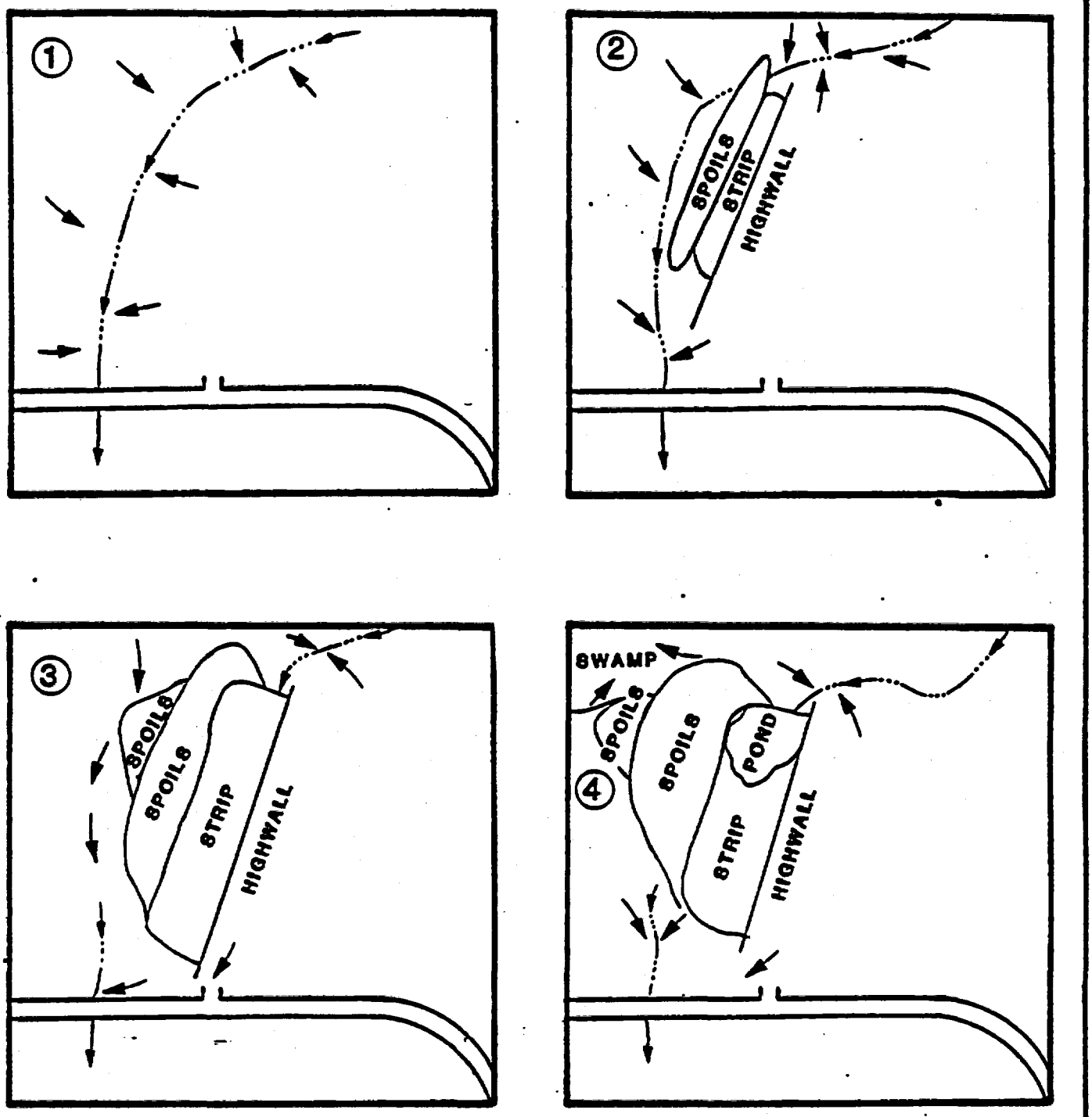

FIGURE IV-6
THE EFFECT OF STRIP MINING OPERATIONS ON DRAINAGE PATTERN DEVELOPMENT OSBORNE SITE

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C. Potential Surface Water Pathways

With the exception of one small area on the southern boundary of the site, the site drainage patterns prevent surface runoff generated on the site from leaving the site. Most surface runoff generated on the site or flowing onto the site ends up in the ponds and recharges the groundwater system.

The only exception is a small area to the south of the gate. Surface water drains from this area into the stream which crosses the road. Based on the chemical analysis of surface water draining this area, there is no evidence of any contamination leaving the site through this pathway.

Consequently, there are no apparent potential surface water pathways that could serve as pathways for contaminant migration.

D. Surface Water Users

Swamp Run, approximately one mile south of the site, receives waters from intermittent streams near the Osborne Site and drains into Wolf Creek. Both Swamp Run and Wolf Creek are used locally as fishing areas. The local swamp is used by wildlife and migratory waterfowl. Outside of recreational uses, no other uses of local surface waters for water supply or industry have been reported.

E. Surface Water Quality

No background data apparently exists on surface water in the area of the site. However, surface water samples were taken at the site by DER in 1977 and 1980, and EPA in 1981 and 1982. Hart has collected surface water samples in December, 1983 at the locations shown in Figure IV-7.

The results of the 1977 and 1980 DER sampling and the 1981 EPA sampling are shown in Table IV-1. Iron, a characteristic of acid mine drainage, was detected in both the on-site lagoons (260 to 6020 ug/l) and site drainages

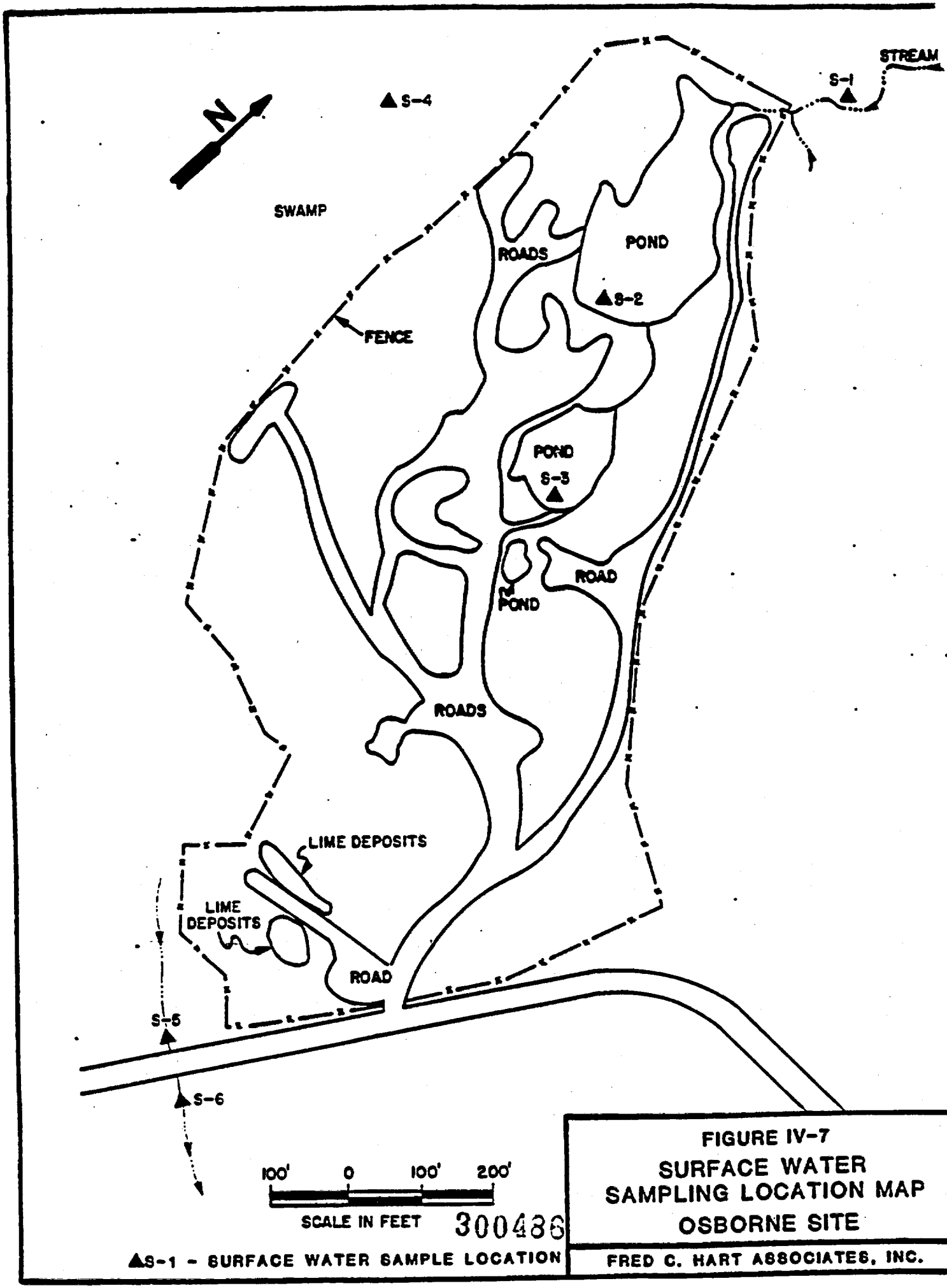

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FIGURE IV-7

SURFACE WATER SAMPLING LOCATION MAP

OSBORNE SITE

▲S-1 - SURFACE WATER SAMPLE LOCATION

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(19,650 ug/l) on the DER sampling trip. Insignificant concentrations of iron and manganese were found in the northern lagoon in the 1981 EPA sampling survey.

The results from the November, 1982 EPA sampling survey and the December, 1983 Hart sampling survey are shown in Table IV-2. On the EPA sampling trip, low levels of metals were detected in the northern lagoon. Samples taken from the swamp contained zinc at 4,809 ug/l and lead at 96 ug/l. Hart's samples showed low levels of copper (5.0 - 68.0 ug/l), nickel (11 - 15 ug/l), and zinc (66.0 - 140.0 ug/l) in the surface water. Iron, zinc, nickel and copper are also common constituents of acid mine drainage (Gang, 1974).

Low levels of organic compounds were also detected in the on-site lagoons and the adjacent swamp in the 1982 EPA samples. The source of this contamination is likely due to the drums which were found floating in the pond. The lagoon contained chloroethane (7.1 ug/l), 1,1-dichloroethane (6.3 ug/l), 1,1,1 trichloroethane (1.4 ug/l) and trichloroethylene (0.6 ug/l). The swamp contained phenol (12 ug/l) and di-n-butyl phthalate (3.57 ug/l). After the drums were removed, no organics were detected above the method detection limit in Hart's samples. It is important to note that the concentrations listed by DER that are less than 10 ug/l are also below the EPA Method Detection Limit and should have been reported as such.

Of importance, use of the Drinking Water Standards and/or Ambient Water Quality Criteria is only useful for comparing relative levels of contaminants since neither the Standards or Criteria apply to contaminated water not used for drinking purposes. Nor should a comparison of measured data against these standards serve as the basis for a risk assessment of any particular site, since the actual risks posed by any site are at the point at which receptors are located and use the potentially contaminated water. In the proper context, however, these data may be useful at the Osborne site, since the comparison puts into perspective how low the measured levels of contaminants actually are prior to any dilution and dispersion that would occur if the contaminants were migrating from the site.

TABLE IV-1

OSBORNE SITE
SURFACE WATER SAMPLE ANALYTICAL RESULTS
PADER AND EPA

Parameter	Location and Date: 6/22/77 Strip Mine Pool PADER	4/18/80 Northern Lagoon PADER	4/18/80 Middle Lagoon PADER	4/18/80 Southern Lagoon PADER	4/18/80 Site Discharge PADER	7/6/81 Northern Lagoon EPA	7/6/81 Middle Lagoon EPA	7/6/81 Stream near Diamond Read EPA	7/6/81 Stream near Pinchalong Road EPA
pH	7.5	-	-	-	-	7.0	7.4	7.2	7.4
Specific Conductance (umhos/cm)	260	-	-	-	-	-	-	-	-
Alkalinity (mg/l)	8.5	-	-	-	-	-	-	-	-
COD (mg/l)	94,667	-	-	-	-	-	-	-	-
BOD (5-day, mg/l)	19,000	-	-	-	-	-	-	-	-
Cadmium (ug/l)	LT1	LT1	LT1	LT1	LT1	-	-	-	-
Chromium (ug/l)	10	LT10	LT10	LT10	LT10	-	-	-	-
Copper (ug/l)	20	10	10	320	100	58	-	-	-
Iron (ug/l)	6,020	260	3,730	1,540	19,650	608	-	-	-
Manganese (ug/l)	770	640	700	40	1,830	263	-	-	-
Nickel (ug/l)	30	10	25	10	55	-	-	-	-
Lead (ug/l)	LT10	10	LT10	10	20	-	-	-	-
Zinc (ug/l)	900	160	10	40	240	-	-	-	-
Sulfate (mg/l)	50	-	-	-	-	-	-	-	-
MBAS (mg/l)	3.2	-	-	-	-	-	-	-	-
Phenols (ug/l)	138	-	-	-	-	0.8	3.9	1.6	2.6
Oil (%)	-	ND	ND	ND	ND	-	-	-	-
Temperature (°F)	-	-	-	-	-	26	24	25	20
Static Toxicity (species unknown)	-	-	-	-	-	-	-	Non-toxic	Non-toxic
Calcium	-	-	-	-	-	23.2	-	-	-
Magnesium	-	-	-	-	-	4.58	-	-	-
Sodium	-	-	-	-	-	3.25	-	-	-
Selenium	-	-	-	-	-	15	-	-	-

- = parameters not analyzed
ND = Not Detected
LT - Less than

TABLE IV-2

OSBORNE SITE
SURFACE WATER SAMPLE ANALYTICAL RESULTS
EPA AND HART

	Blank 821100-01 EPA	Pond 3 (Northern) 821100-00 EPA	Swamp 821100-10 EPA	Blank 821100-11 EPA	Pond 3 (Northern) 821100-12 EPA	Swamp 821100-13 EPA	Creek S-1 FCHA	Large Pond S-2 FCHA	Medium Pond S-3 FCHA	Swamp S-4 FCHA	Stream near old lagoons S-5 FCHA	Downstream of culvert S-6 FCHA
bis(2-ethylhexyl) phthalate	ND	ND	ND	ND	ND	ND	ND	ND	BMDL	ND	ND	BMDL
di-n-butyl phthalate	ND	ND	3.57	ND	*	*	BMDL	ND	BMDL	BMDL	ND	ND
Chloroethane	ND	ND	ND	ND	7.1	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloro-ethane	ND	ND	ND	ND	6.3	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	ND	ND	ND	ND	ND	ND	BMDL	BMDL	BMDL	BMDL	ND	ND
Toluene	ND	ND	ND	ND	ND	ND	BMDL	ND	ND	ND	ND	ND
1,1,1-Trichloro-ethane	ND	ND	ND	ND	1.4	ND	ND	ND	ND	ND	ND	ND
Trichloroethylene	ND	ND	ND	ND	0.6	ND	ND	ND	BMDL	ND	ND	ND
1,1,2,2-tetra-chloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	BMDL
Trichlorofluor-omethane	ND	ND	ND	ND	ND	ND	BMDL	BMDL	ND	BMDL	BMDL	BMDL
Phenol	ND	ND	12.0	ND	LT 1	LT 1	ND	ND	ND	ND	ND	ND

TABLE IV-2 (Continued)

OSBORNE SITE
SURFACE WATER SAMPLE ANALYTICAL RESULTS
EPA AND HART

	Blank 8211008-01 EPA	Pond 3 (Northern) 821108-08 EPA	Swamp 821108-10 EPA	Blank 821108-11 EPA	Pond 3 (Northern) 821108-12 EPA	Swamp 821108-13 EPA	Creek S-1 FCNA	Large Pond S-2 FCNA	Medium Pond S-3 FCNA	Swamp S-4 FCNA	Stream near old lagoons S-5 FCNA	Downstream of culvert S-6 FCNA
Antimony	LT 5.0	LT 5.0 90%	LT 5.0	-	-	-	ND	ND	ND	ND	ND	LT 60
Arsenic	LT 2.0	LT 2.0	4.9 (MSA)	-	-	-	ND	LT 5	ND	LT 5	LT 5	LT 5
Beryllium	LT 5.0	LT 5 101%	LT 5.0	-	-	-	ND	ND	ND	ND	ND	ND
Cadmium	LT 1.0	2.0±.40	24 93%	-	-	-	LT 5	ND	ND	ND	ND	ND
Chromium	LT 2.0	LT 2.0	6.3 (MSA)	-	-	-	ND	ND	ND	LT 10	ND	LT 10
Copper	LT 25	LT 25	LT 25 89%	-	-	-	5.0	27.0	10.0	60.0	26.0	20.0
Lead	LT 2.0	5.3 (MSA)	96±.3.3 96%	-	-	-	ND	ND	ND	LT 50	ND	LT 50
Mercury	LT .20	LT .20 90%	.27±.02	-	-	-	ND	ND	LT .3	ND	ND	ND
Nickel	LT 40	LT 40	264 85%	-	-	-	15	14	11	12	LT 10	LT 10
Selenium	LT 2.0	LT 4.0	LT 4 (MSA)	-	-	-	ND	ND	LT 5	ND	LT 5	LT 5
Silver	LT 1.0	LT 1 (MSA)	LT 1.0	-	-	-	ND	ND	ND	ND	ND	ND
Thallium	LT 10	LT 10 (MSA)	LT 10	-	-	-	ND	ND	ND	ND	ND	ND

TABLE IV-2 (Continued)

OSBORNE SITE
SURFACE WATER SAMPLE ANALYTICAL RESULTS
EPA AND HART

	Blank 821108-01 EPA	Pond 3 (Northern) 821108-09 EPA	Swamp 821108-10 EPA	Blank 821108-11 EPA	Pond 3 (Northern) 821108-12 EPA	Swamp 821108-13 EPA	Creek S-1 FCNA	Large Pond S-2 FCNA	Medium Pond S-3 FCNA	Swamp S-4 FCNA	Stream near old lagoons S-5 FCNA	Downstream of culvert S-6 FCNA
Zinc	LT 10	83	4,809 107%	-	-	-	66.0	72.0	90.0	140.0	10.0	42.0

ND = Not Detected
LT = Less Than
BMDL = Below Method Detection Limit (LT 10 ug/l)
* = Not Detected After Correction for Reagent Blank
MSA = Method of Standard Additions
\- = Not Analyzed

NOTE: Concentrations are in ug/l (ppb).
EPA samples were collected on November 4, 1982.
HART samples were collected on December 8-9, 1983.

In summary, sampling conducted to date at the site indicates elevated levels of metals in surface waters. Table IV-3 summarizes metals detected in the surface water at the Osborne Site during various sampling programs. Cadmium, lead, mercury, nickel iron, and manganese were detected at levels above EPA Interim Drinking Water Standards. It is quite likely that these elevated levels are related to former mining activities at the site. The nickel, zinc, iron, and manganese may be due to acid mine drainage (Gang, 1974). The lead levels may be high because the area is rich in bituminous coal (Gang, 1974).

Table IV-4 summarizes organic compounds detected in the surface water at the Osborne Site. All of the identified organic compounds were detected at levels below Ambient Water Quality Criteria.

TABLE IV-3

INORGANIC COMPOUNDS DETECTED IN SURFACE WATER AT THE OSBORNE SITE

Compound	Range detected at Osborne Site (ug/l)	Constituents Commonly Found in Acid Mine Drainage (ug/l)[a]	EPA Drinking Water Standards (ug/l)	Ambient Water Quality Criteria[b] (ug/l)
Arsenic	LT 5	-	50	0(0.002)
Cadmium	2.8 - 24	0.3 - 13.1	10	10
Chromium	LT 10	0.0 - 120	50	50
Copper	5.0 - 68.0	1.5 - 410	1000	1000
Lead	5.3 - 96	0.3 - 7.0	50	50
Mercury	LT .3	2	.144	
Nickel	11 - 264	40 - 7500	-	13.4
Zinc	10.0 - 83.0	1 - 14,500	5000	5000
Iron	260 - 19,650	0 - 510,000	300	-
Manganese	40 - 1830	0 - 281,000	50	-

[a] Gang and Langmuir, 1974.

b These Water Quality Criteria for ambient water concentration are based on consumption of 2 liters of water per day. The recommended "safe level" for all known or suspect carcinogens is zero; the concentration estimated to result in one additional case of cancer in one million people (10^{-6} risk) is given in parentheses.

LT - Less Than

TABLE IV-4

ORGANIC COMPOUNDS DETECTED IN SURFACE WATER AT THE OSBORNE SITE

Compound	Range detected at Osborne Site (ug/l)	Ambient Water Quality Criteria[a] (ug/l)
Chloroethane	7.1	-
1,1-dichloroethane	6.3	-
1,1,1-trichloroethane	1.4	18.400
Trichloroethylene	0.6 - LT 10	0 (2.7)
di-n-butyl phthalate	3.57 -LT 10	34,000
Phenol	LT 1 - 12	3500

a These Water Quality Criteria for ambient water concentrations are based on consumption of .2 liters of water and 18.7 grams fish and shell fish products per day. The recommended "safe level" for all known or suspect carcinogens is zero; the concentration estimated to result in one additional case of cancer in one million people (10^{-6} risk) is given in parentheses.

LT - Less Than

CHAPTER V

GEOLOGY AND HYDROGEOLOGY

This chapter synthesizes the geologic and hydrogeologic data collected during the Remedial Investigation. It responds to the directives of the Consent Order and Agreement Work Plan to address the geologic conditions at the site, groundwater flow direction and gradient, and groundwater quality.

This chapter first describes the regional geologic conditions in the area of the site, including hydrogeology and groundwater usage. Site specific geologic and hydrogeologic data are presented in terms of potential for hydrogeologic units to act as pathways for contaminant migration. Test drilling data, geophysical logs and permeability testing data are coupled with information from the void investigation report to analyze these pathways. Groundwater users in the area are identified, and chemical data is presented to serve as the baseline for completion of the subsequent risk assessment. In addition, mathematical models were utilized to evaluate various conservative or worst-case contaminant migration scenarios.

A. Regional Geology and Hydrogeology

The Osborne site is located on the glaciated Alleghany plateau. Bedrock geology in the Grove City area consists of nearly flat lying sedimentary rocks of late Paleozoic age. The site sits on the western flank of the Pittsburgh-Huntington Basin. Generally, bedrock formations exhibit a southward regional dip of about 14 feet per mile. Major fractures occur along bedding planes. Although the area is not a tectonically active zone which could have caused faulting, some joints may occur in the area. These joints, which are nearly vertical, typically are oriented N35°E and N40°W (Poth, 1963). Figure V-1 shows a generalized stratigraphic column for the Grove City area. Table V-1 lists the geology and hydrogeology of the lithologic units in the area.

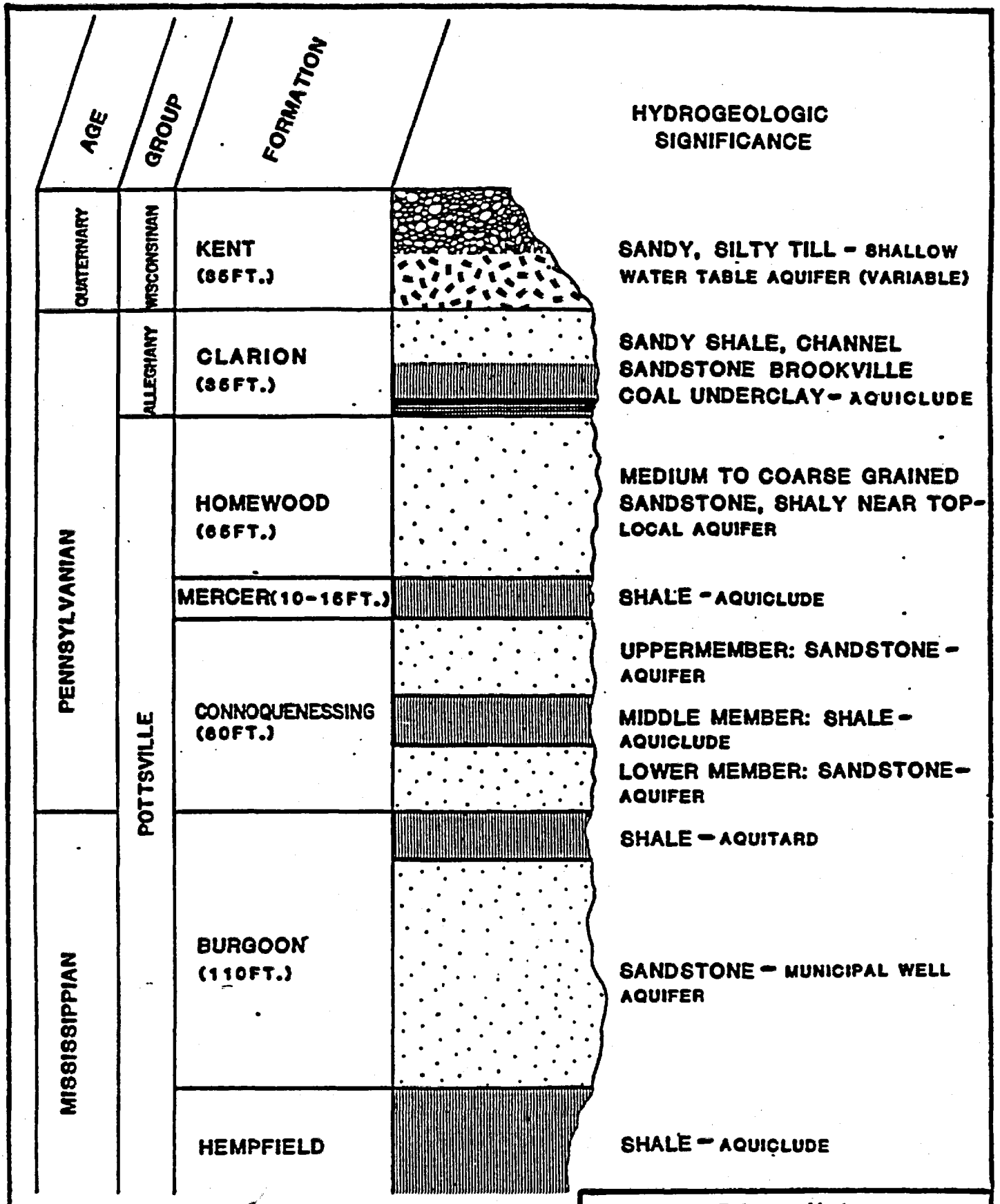

FIGURE V-1

GENERALIZED STRATIGRAPHIC COLUMN
OSBORNE SITE

FRED C. HART ASSOCIATES, INC.

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TABLE V-1

GEOLOGY AND HYDROGEOLOGY OF THE GROVE CITY, PA AREA

Age	Group	Formation	Lithology	Thickness (ft.)	Water Bearing Characteristics
Quarternary	(Wisconsin Glaciation)	Kent end and ground moraine	Sandy, silty till with some gravels	25' - 100'	yields range from 10 to 18 gpm
Pennsylvanian	Alleghany	Clarion Fm.	Shale and channel sandstones. Brookville coal and its underclay are present at the site and mark the bottom of the formation.	Brookville coal 3'-4' underclay 1'-2'	no wells normally finished in the Brookville coal. Top of formation can yield to 150 gpm.
Pennsylvanian	Pottsville	Homewood Fm.	Medium to coarse grained loosely cemented sandstone, shale near top.	65' - 70'	maximum permeability at site 10^{-3} cm/sec
Pennsylvanian	Pottsville	Mercer Fm.	Shale	10' - 15'	permeability 1 x 10^{-8} cm/sec
Pennsylvanian	Pottsville	Connoquenessing Fm.	Upper member: medium grained sandstone;	35'	permeability of sandstone 10^{-3} cm/sec
			Middle member: shale	10'	permeability of shale less than 10^{-8} cm/sec
			Lower member: medium grained sandstone	35'	
Mississippian	--	Burgoon Sandstone	Upper shale member; Lower member: fine to medium grained sandstone	10' 100'	used generally for high yield industrial and public supply wells. yield at Grove City is 1,000 gpm with 16 ft. of drawdown. Average Transmissibility 70,000 to 100,000 gpd/ft. Storage coefficient 10^{-5} Permeability 10^{-2} cm/sec.

In brief, deposition of sediments in the Mississippian and Pennsylvanian periods of the late Paleozoic era was cyclic, and gradational sequences of rock types found in this area are continually repeated in the stratigraphic record. As a result, lithologies vary with depth, and any formation may contain coal, limestone, sandstone, shale, clay, or any combination of these. Although the formations themselves may be regionally extensive, particular beds may interfinger with other beds or may disappear completely.

Glacial deposits make up the majority of the overburden soils in the Grove City area. Historically, glacial erosion created an undulating bedrock surface which resulted in topographic hills and valleys. The subsequent deposition of glacial material in the valleys left "islands" of bedrock (Poth, 1963). These islands control regional groundwater and surface water flow throughout the area. Poth (1963) coined the concept of the "hydrologic island" to explain groundwater flow patterns in the area. Figure V-2 presents the concept of the hydrologic island and resulting groundwater movement. This concept is necessary to the understanding of the regional flow patterns in the area.

As shown on the Figure V-2, rain recharges the top bedrock aquifers at the topographic highs. Groundwater then moves downward and/or radially, away from the island centers, depending on the permeability of the underlying formation. Throughout the area, sandstone units act as aquifers or groundwater reservoirs, and shale units act as aquicludes or zones which do not allow groundwater flow. When groundwater reaches the point at which the aquifer has been eroded away, the groundwater either discharges to the surface or is transmitted into the unconsolidated glacial deposits in the valleys. Groundwater then moves downgradient through the glacial deposits. Where the water table in these glacial deposits is higher than the ground surface, groundwater discharge areas (in areas where groundwater discharges into surface water) occur. It is at these points that streams, ponds, and swamps are found.

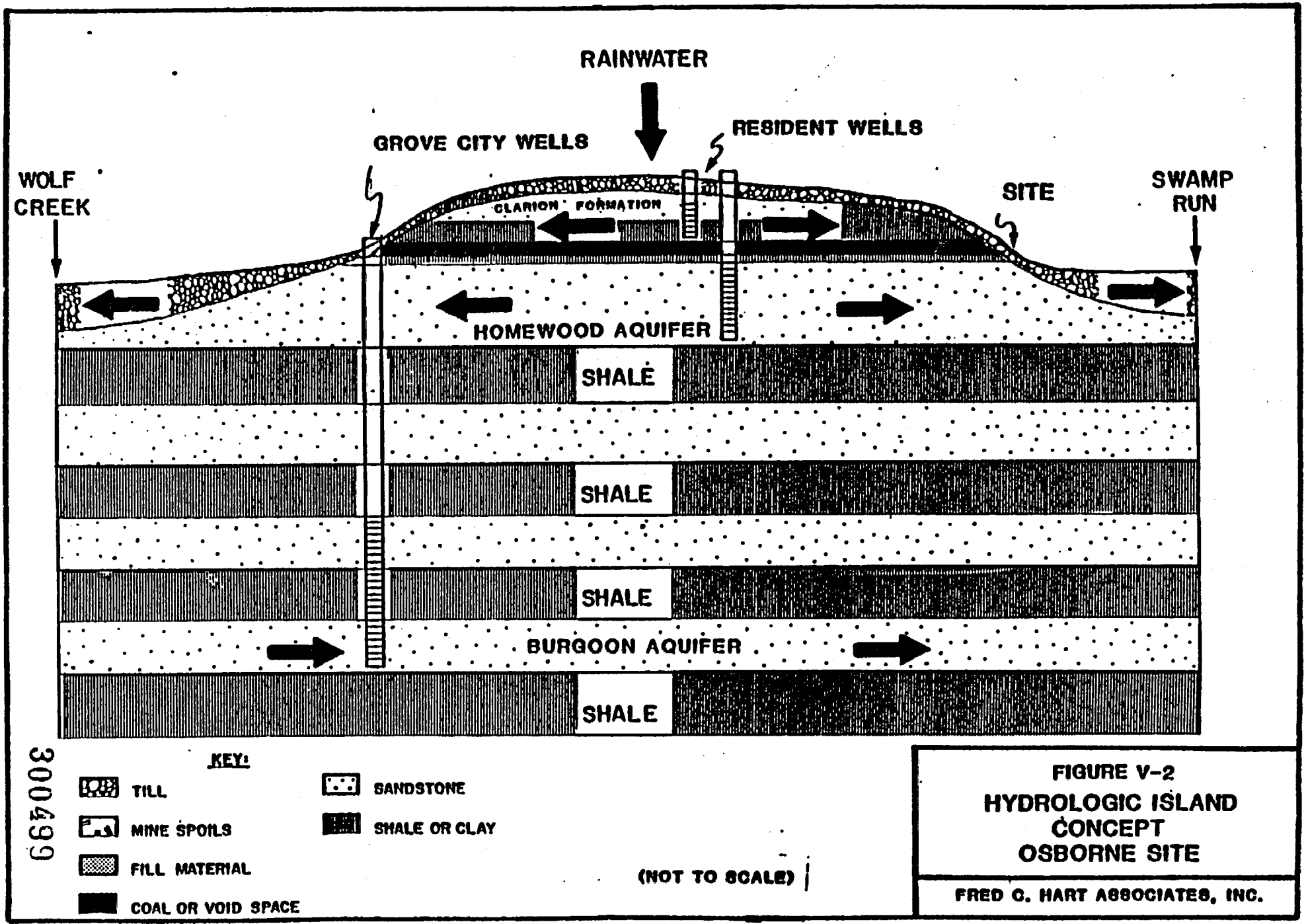

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FIGURE V-2
HYDROLOGIC ISLAND CONCEPT
OSBORNE SITE

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Different aquifers are used for groundwater supply, depending on location. Glacial deposits are sometimes utilized as a shallow source of groundwater supply in the region. This practice is utilized for domestic wells requiring small amounts of water, and occasionally for larger wells in deep river valley deposits. In some instances, when glacial deposits do not supply sufficient water for domestic use, these deposits are sealed or cased off, and the uppermost bedrock aquifer beneath the unconsolidated deposits is tapped. Two bedrock aquifers are utilized in this way in the area of the site. On the tops of the hydrologic islands, the Upper Clarion sandstone is sometimes tapped as a groundwater supply. According to local well drillers, water supply wells are never drilled into the lower Clarion Formation because the coal seams provide poor quality water. Further out toward the valleys at the sides of the hydrologic islands, the Homewood sandstone is the uppermost bedrock aquifer and is sometimes utilized as a groundwater supply. The groundwater quality of the Homewood aquifer is protected by the underclay and the shaly zones that separate the Homewood from the overlying Clarion formation.

The upper and lower Connoquennessing formation and the Burgoon formation are capped by low permeability shale layers. These shale layers act as confining layers which isolate the deeper aquifers from the near surface aquifers in the vicinity of the site. Only in areas north of Grove City, where glacial erosion has cut through the confining shale layers, do these formations exhibit the hydrologic island concept shown in Figure V-2.

B. Site Geology and Hydrogeology

Appendix A contains geologic and drillers logs for test holes drilled at the Osborne Site. Figure V-3 is a geologic cross-section through the site constructed from these logs. Geologic conditions found at the site are consistent with the regional geology outlined previously. Rock coring operations at the site revealed, however, the absence of the Vanport limestone formation and the upper coal unit or "scrubgrass" coal of the Clarion formation. Poth, (1963) by extrapolation, indicated the presence of these formations in the area of the site on the bedrock geology map of Mercer County. However, no local subsurface data for this area was available prior to the Osborne Site Remedial Investigation.

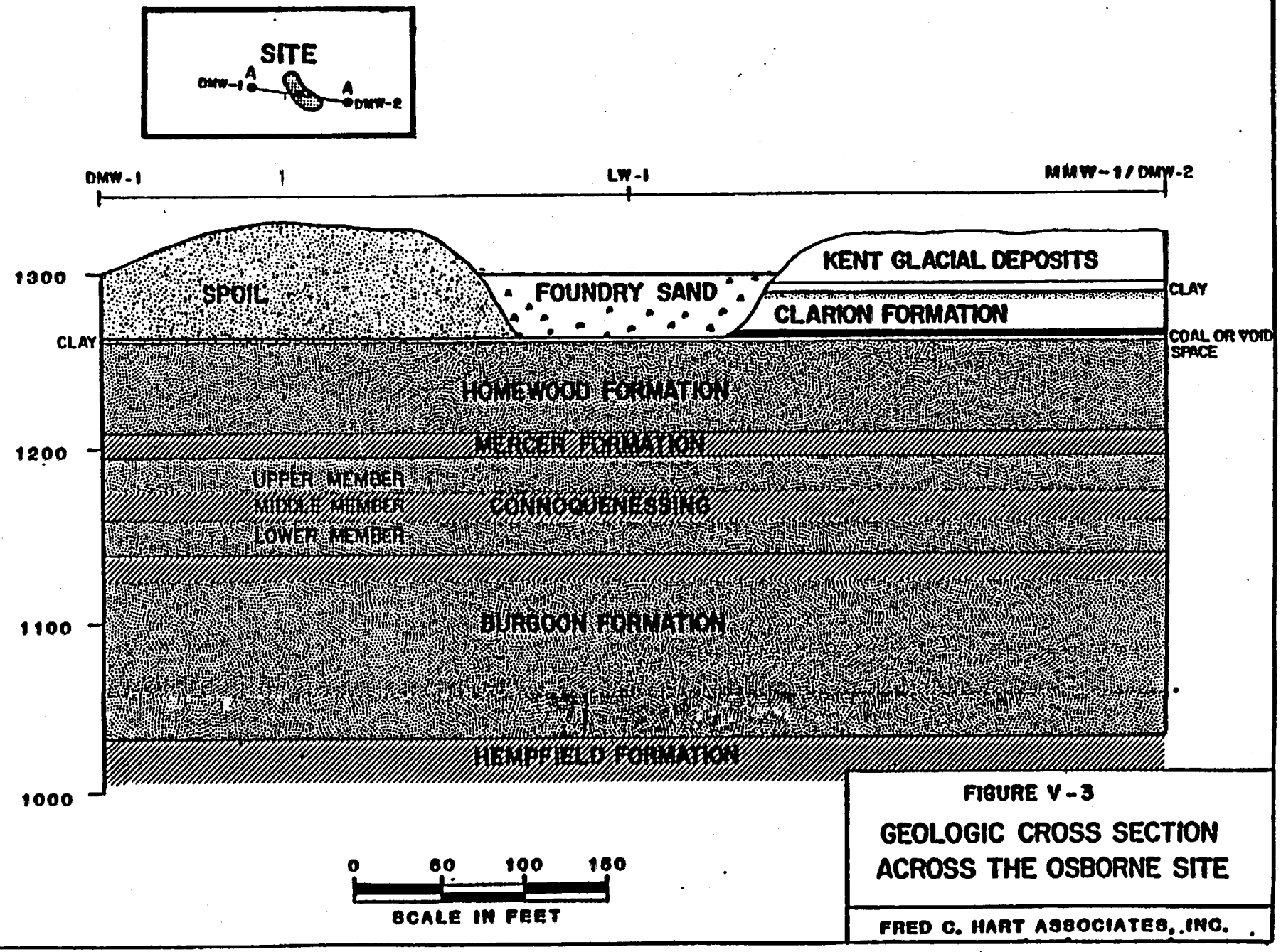

FIGURE V-3

GEOLOGIC CROSS SECTION ACROSS THE OSBORNE SITE

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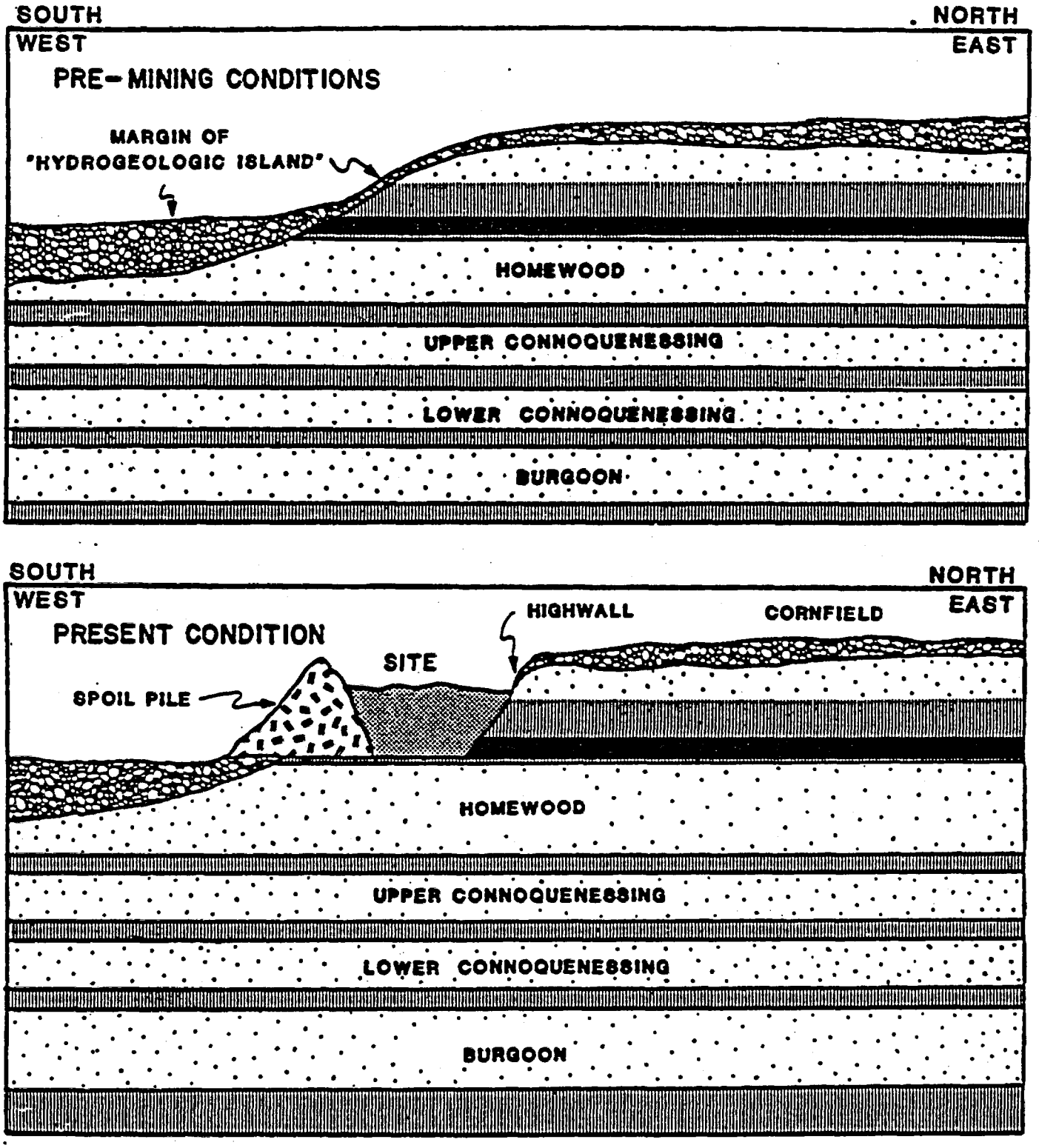
The Clarion formation, consisting of shale, sandstone, and coal, is present under the cornfield to the east of the highwall. However, the three to four foot thick Brookville coal seam has been mined out at rock coring location CMW-1 (Hart, 1984). This was evidenced by three to four feet of void space encountered during drilling. Downhole television inspections and pump testing also indicated the possibility of deep mine shafts under the cornfield adjoining the site.

Beneath the Brookville coal lies an underclay commonly called "fire clay". This layer of clay forms a lining underneath the Brookville coal thoroughout the region. Since the clay layer was found in every boring, it appears to be continuous under the site.

Underlying the Brookville coal and its underclay is a cyclic repetition of lithologic units consisting of sandstone and shale. The sandstone units act as aquifers, while the shale units act to retard or prevent groundwater flow. At the base of the Homewood sandstone, the sand grains become very coarse. Underlying this very coarse sandstone is a very thin layer of coal. This unit defines the base of the Homewood sandstone.

The subsurface interpretation of the Osborne site is complex for two reasons. First, the site is located at the edge of a hydrogeologic island. Second, the site has been disturbed by deep mining, followed by strip mining and associated spoil disposal. Figure V-4 is a cross-section that compares the site before and after mining activities. As the glaciers eroded bedrock to form the "hydrogeologic islands," coal was exposed at the glacier-bedrock interface near the 1,300 foot elevation datum. Figure V-5 shows the margins of the hydrogeologic island. To permit removal of the coal, the overburden was removed, or "stripped." Stripping started at the glacial-bedrock "hydrogeologic island" margin and moved into the hill. Glacial and bedrock overburden, removed to uncover the coal, was deposited behind the mining operation. This material, known as "mine spoils," created large piles of high relief along the extent of the stripped area. The strip mine continued to operate until it reached the area where coal had already been removed by deep mining operations on the northeast side of the site. At that point--



KEY:

- TILL
- MINE SPOILS
- FILL MATERIAL
- COAL OR VOID SPACE
- SANDSTONE
- SHALE OR CLAY

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(NOT TO SCALE)

FIGURE V-4

COMPARISON OF CONDITIONS

OSBORNE SITE

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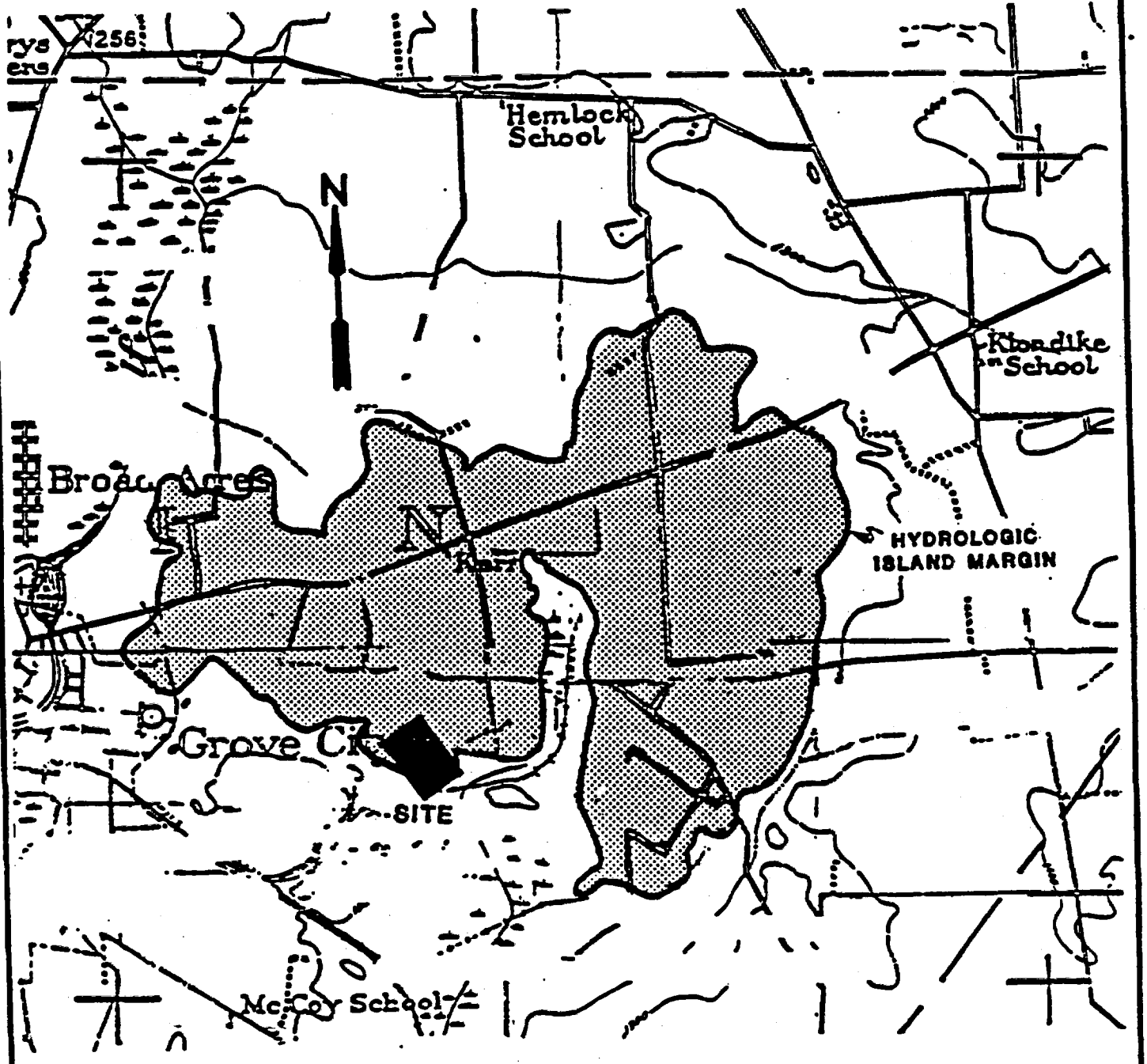

AFTER HART, 1983

0 1/2 1 2

SCALE IN MILES

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FIGURE V-5
HYDROLOGIC ISLAND MARGINS
OSBORNE SITE

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